General-purpose Relay
MY

Versatile and Function-filled Miniature Power Relay for Sequence Control and Power Switching Applications

- Many variations possible through a selection of operation indicators (mechanical and LED indicators), test button, built-in diode and CR (surge suppression), bifurcated contacts, etc.
- Arc barrier standard on 4-pole Relays.
- Dielectric strength: 2,000 VAC (coil to contact)
- Environment-friendly cadmium-free contacts.
- Safety standard approvals obtained.
- Wide range of Sockets (PY, PYF Series) and optional parts are available.
- Max. Switching Current: 2-pole: 10 A, 4-pole: 5 A
- Built-in mechanical operation indicator.
- Provided with nameplate.

LR

Ordering Information

■ Relays

Standard Coil Polarity

Type	Contact form	Plug-in socket/Solder terminals		Without LED indicator
		Standard with LED indicator	With LED indicator and test button	
Standard	DPDT	MY2N	MY2IN	MY2
	4PDT	MY4N	MY4IN	MY4
	4PDT (bifurcated)	MY4ZN	MY4ZIN	MY4Z
With built-in diode (DC only)	DPDT	MY2N-D2	MY2IN-D2	---
	4PDT	MY4N-D2	MY4IN-D2	---
	4PDT (bifurcated)	MY4ZN-D2	MY4ZIN-D2	---
With built-in CR (220/240 VAC, 110/120 VAC only)	DPDT	MY2N-CR	MY2IN-CR	---
	4PDT	MY4N-CR	MY4IN-CR	---
	4PDT (bifurcated)	MY4ZN-CR	MY4ZIN-CR	---

Reverse Coil Polarity

Type	Contact form	Plug-in socket/Solder terminals	
		With LED indicator	With LED indicator and test button
Standard (DC only)	DPDT	MY2N1	MY2IN1
	4PDT	MY4N1	MY4IN1
	4PDT (bifurcated)	MY4ZN1	MY4ZIN1
With built-in diode (DC only)	DPDT	MY2N1-D2	MY2IN1-D2
	4PDT	MY4N1-D2	MY4IN1-D2
	4PDT (bifurcated)	MY4ZN1-D2	MY4ZIN1-D2

Note: When ordering, add the rated coil voltage and “(s)” to the model number. Rated coil voltages are given in the coil ratings table.

Example: MY2 6VAC (S)

New model

Rated coil voltage

■ Accessories (Order Separately)

Sockets

Poles	Front-mounting Socket (DIN-track/ screw mounting)	Back-mounting Socket				
		Solder terminals		Wire-wrap terminals		PCB terminals
		Without clip	With clip	Without clip	With clip	
2	PYF08A-E PYF08A-N	PY08	PY08-Y1	PY08QN PY08QN2	PY08QN-Y1 PY08QN2-Y1	PY08-02
4	PYF14A-E PYF14A-N	PY14	PY14-Y1	PY14QN PY14QN2	PY14QN-Y1 PY14QN2-Y1	PY14-02

Socket Hold-down Clip Pairing

Relay type	Poles	Front-connecting Socket (DIN-track/ screw mounting)		Back-connecting Socket			
				Solder/Wire-wrap terminals		PCB terminals	
		Socket	Clip	Socket	Clip	Socket	Clip
Without 2-pole test button	2	PYF08A-E PYF08A-N	PYC-A1	PY08(QN)	PYC-P PYC-P2	PY08-02	PYC-P PYC-P2
	4	PYF14A-E PYF14A-N		PY14(QN)		PY14-02	
2-pole test button	2	PYF08A-E PYF08A-N	PYC-E1	PY08(QN)	PYC-P2	PY08-02	PYC-P2

Mounting Plates for Sockets

Socket model	For 1 Socket	For 18 Sockets	For 36 Sockets
PY08, PY08QN(2), PY14, PY14QN(2)	PYP-1	PYP-18	PYP-36

Note: PYP-18 and PYP-36 can be cut into any desired length in accordance with the number of Sockets.

Track and Accessories

Supporting Track (length = 500 mm)	PFP-50N
Supporting Track (length = 1,000 mm)	PFP-100N, PFP-100N2
End Plate	PFP-M
Spacer	PFP-S

Specifications

■ Coil Ratings

Rated voltage		Rated current		Coil resistance	Coil inductance (reference value)		Must operate voltage	Must release voltage	Max. voltage	Power consumption (approx.)
		50 Hz	60 Hz		Arm. OFF	Arm. ON	% of rated voltage			
AC	6 V*	214.1 mA	183 mA	12.2 Ω	0.04 H	0.08 H	80% max.	30% min.	110%	1.0 to 1.2 VA (60 Hz)
	12 V	106.5 mA	91 mA	46 Ω	0.17 H	0.33 H				
	24 V	53.8 mA	46 mA	180 Ω	0.69 H	1.30 H				
	48/50 V*	24.7/ 25.7 mA	21.1/ 22.0 mA	788 Ω	3.22 H	5.66 H				
	110/120 V	9.9/10.8 mA	8.4/9.2 mA	4,430 Ω	19.20 H	32.1 H				0.9 to 1.1 VA (60 Hz)
	220/240 V	4.8/5.3 mA	4.2/4.6 mA	18,790 Ω	83.50 H	136.4 H				
DC	6 V*	151 mA		39.8 Ω	0.17 H	0.33 H		10% min.		0.9 W
	12 V	75 mA		160 Ω	0.73 H	1.37 H				
	24 V	37.7 mA		636 Ω	3.20 H	5.72 H				
	48 V*	18.8 mA		2,560 Ω	10.60 H	21.0 H				
	100/110 V	9.0/9.9 mA		11,100 Ω	45.60 H	86.2 H				

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with tolerances of +15%/–20% for rated currents and ±15% for DC coil resistance.

2. Performance characteristic data are measured at a coil temperature of 23°C.

3. AC coil resistance and impedance are provided as reference values (at 60 Hz).

4. Power consumption drop was measured for the above data. When driving transistors, check leakage current and connect a bleeder resistor if required.

5. Rated voltage denoted by "*" will be manufactured upon request. Ask your OMRON representative.

■ Contact Ratings

Item	2-pole		4-pole		4-pole (bifurcated)	
	Resistive load ($\cos\phi = 1$)	Inductive load ($\cos\phi = 0.4$, L/R = 7 ms)	Resistive load ($\cos\phi = 1$)	Inductive load ($\cos\phi = 0.4$, L/R = 7 ms)	Resistive load ($\cos\phi = 1$)	Inductive load ($\cos\phi = 0.4$, L/R = 7 ms)
Rated load	5A, 250 VAC 5A, 30 VDC	2A, 250 VAC 2 A, 30 VDC	3 A, 250 VAC 3 A, 30 VDC	0.8 A, 250 VAC 1.5 A, 30 VDC	3 A, 250 VAC 3 A, 30 VDC	0.8 A, 250 VAC 1.5 A, 30 VDC
Carry current	10 A (see note)		5 A (see note)			
Max. switching voltage	250 VAC 125 VDC		250 VAC 125 VDC			
Max. switching current	10 A		5 A			
Max. switching power	2,500 VA 300 W	1,250 VA 300 W	1,250 VA 150 W	500 VA 150 W	1,250 VA 150 W	500 VA 150 W
Failure rate (reference value)	5 VDC, 1 mA		1 VDC, 1 mA		1 VDC, 100 μA	

Note: Don't exceed the carry current of a Socket in use. Please see page 15.

■ Characteristics

Item	All Relays
Contact resistance	100 mΩ max.
Operate time	20 ms max.
Release time	20 ms max.
Max. operating frequency	Mechanical: 18,000 operations/hr Electrical: 1,800 operations/hr (under rated load)
Insulation resistance	1,000 MΩ min. (at 500 VDC)
Dielectric strength	2,000 VAC, 50/60 Hz for 1.0 min (1,000 VAC between contacts of same polarity)
Vibration resistance	Destruction: 10 to 55 to 10 Hz, 0.5 mm single amplitude (1.0 mm double amplitude) Malfunction: 10 to 55 to 10 Hz, 0.5 mm single amplitude (1.0 mm double amplitude)
Shock resistance	Destruction: 1,000 m/s^2 Malfunction: 200 m/s^2
Endurance	See the following table.
Ambient temperature	Operating: –55°C to 70°C (with no icing)
Ambient humidity	Operating: 5% to 85%
Weight	Approx. 35 g

Note: The values given above are initial values.

■ Endurance Characteristics

Pole	Mechanical life (at 18,000 operations/hr)	Electrical life (at 1,800 operations/hr under rated load)
2-pole	AC:50,000,000 operations min. DC:100,000,000 operations min.	500,000 operations min.
4-pole		200,000 operations min.
4-pole (bifurcated)	20,000,000 operations min.	100,000 operations min.

■ Approved Standards

VDE Recognitions (File No. 112467UG, IEC 255, VDE 0435)

No. of poles	Coil ratings	Contact ratings	Operations
2	6, 12, 24, 48/50, 100/110 110/120, 200/220, 220/240 VAC 6, 12, 24, 48, 100/110, 125 VDC	10 A, 250 VAC (cosϕ=1) 10 A, 30 VDC (L/R=0 ms)	10 x 10^3
4		5 A, 250 VAC (cosϕ=1) 5 A, 30 VDC (L/R=0 ms)	100 x 10^3 MY4Z AC; 50 x 10^3

UL508 Recognitions (File No. 41515)

No. of poles	Coil ratings	Contact ratings	Operations
2	6 to 240 VAC 6 to 125 VDC	10 A, 30 VDC (General purpose) 10 A, 250 VAC (General purpose)	6 x 10^3
4		5 A, 250 VAC (General purpose) 5 A, 30 VDC (General purpose)	

CSA C22.2 No. 14 Listings (File No. LR31928)

No. of poles	Coil ratings	Contact ratings	Operations
2	6 to 240 VAC 6 to 125 VDC	10 A, 30 VDC 10 A, 250 VAC	6 x 10^3
4		5 A, 250 VAC (Same polarity) 5 A, 30 VDC (Same polarity)	

IMQ (File No. EN013 to 016)

No. of poles	Coil ratings	Contact ratings	Operations
2	6, 12, 24, 48/50, 100/110 110/120, 200/220, 220/240 VAC 6, 12, 24, 48, 100/110, 125 VDC	10 A, 30 VDC 10 A, 250 VAC	10 x 10^3
4		5 A, 250 VAC 5 A, 30 VDC	100 x 10^3 MY4Z AC; 50 x 10^3

LR Recognitions (File No. 98/10014)

No. of poles	Coil ratings	Contact ratings	Operations
2	6 to 240 VAC 6 to 125 VDC	10 A, 250 VAC (Resistive) 2 A, 250 VAC (PF0.4) 10 A, 30 VDC (Resistive) 2 A, 30 VDC (L/R=7 ms)	50 x 10^3
4		5 A, 250 VAC (Resistive) 0.8 A, 250 VAC (PF0.4) 5 A, 30 VDC (Resistive) 1.5 A, 30 VDC (L/R=7 ms)	50 x 10^3

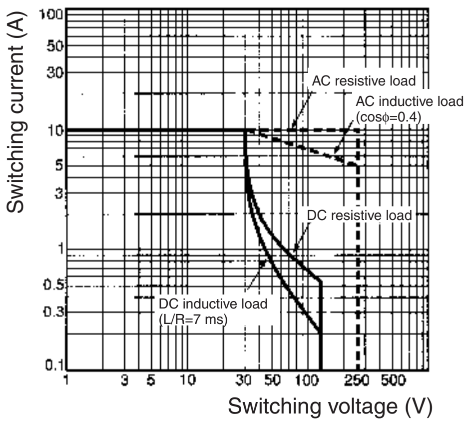
SEV Listings (File No. 99.5 50902.01)

No. of poles	Coil ratings	Contact ratings	Operations
2	6 to 240 VAC 6 to 125 VDC	10 A, 250 VAC 10 A, 30 VDC	10 x 10^3
4		5 A, 250 VAC 5 A, 30 VDC	100 x 10^3 MY4Z AC; 50 x 10^3

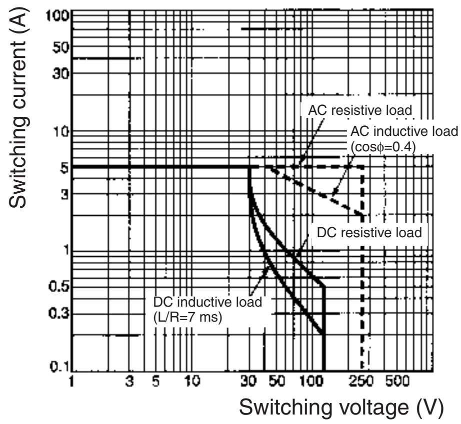
Engineering Data

Maximum Switching Power

MY2

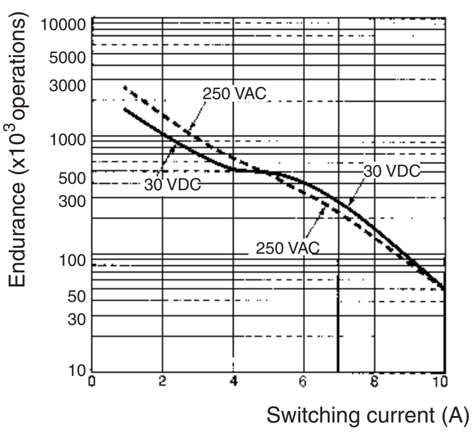


MY4, MY4Z

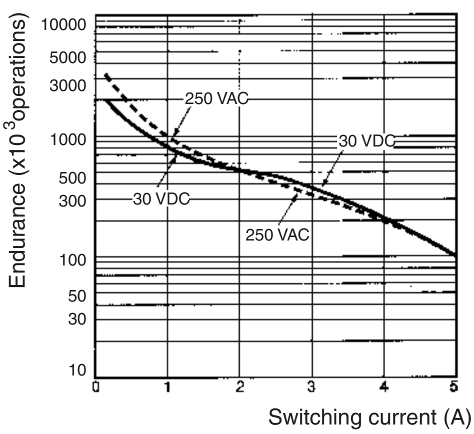


Endurance

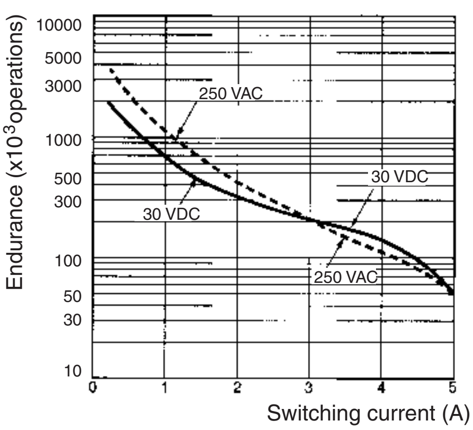
MY2 (Resistive Loads)



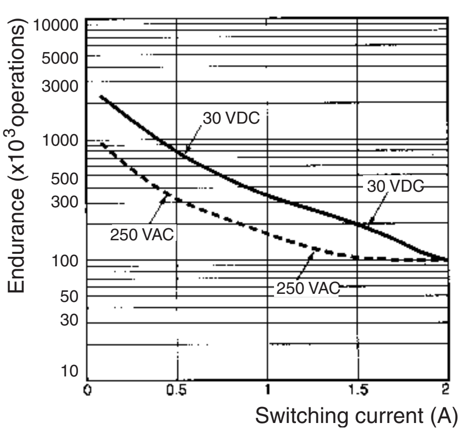
MY2 (Inductive Loads)



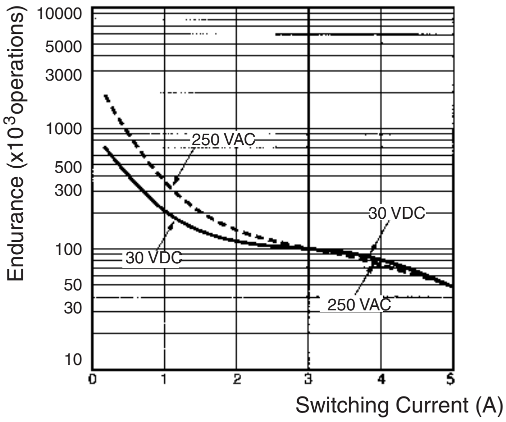
MY4 (Resistive Loads)



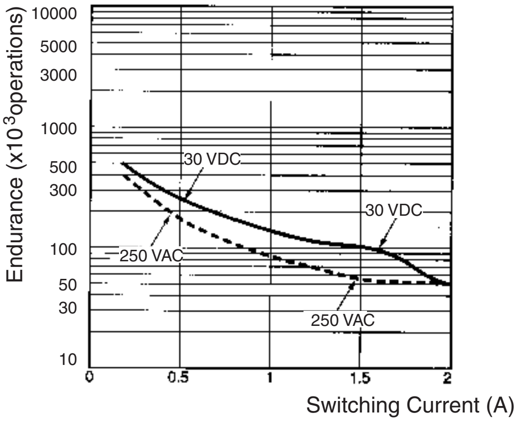
MY4 (Inductive Loads)



MY4Z (Resistive Loads)



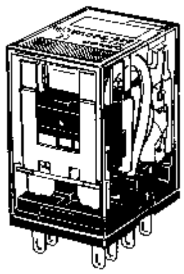
MY4Z (Inductive Loads)

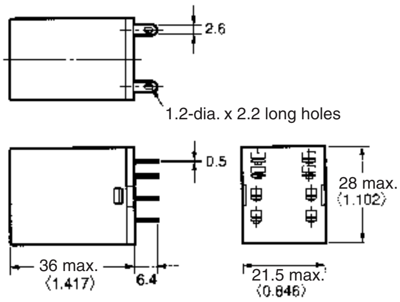


Dimensions

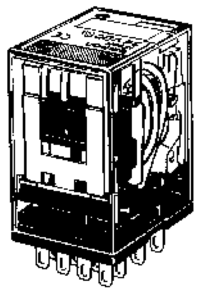
Note: All units are in millimeters unless otherwise indicated.

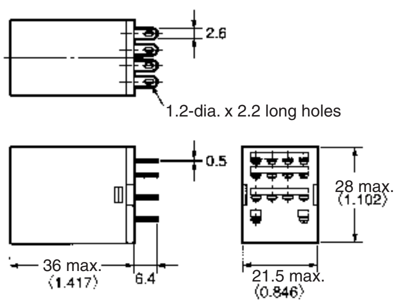
2-Pole Models



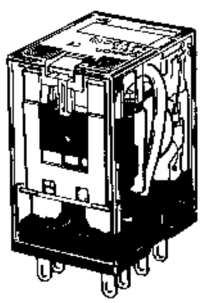


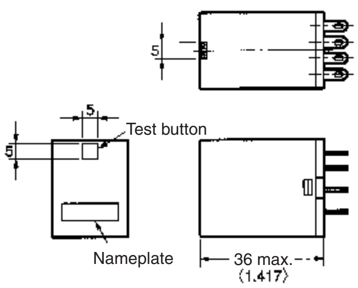
4-Pole Models





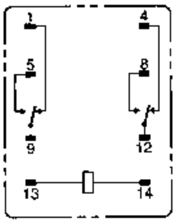
Models with Test Button



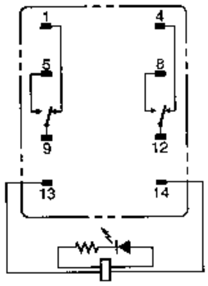


Terminal Arrangement/Internal Connections (Bottom View)

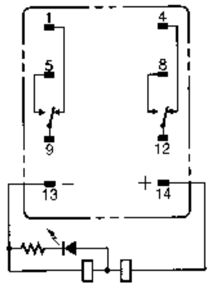
MY2



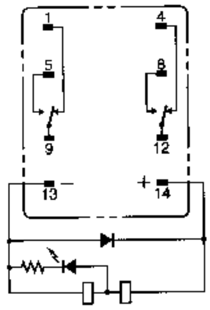
MY2N/MY2IN (AC Models)



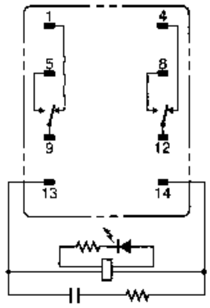
MY2N/MY2IN (DC Models)



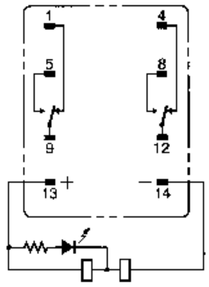
MY2N-D2/MY2IN-D2 (DC Models Only)



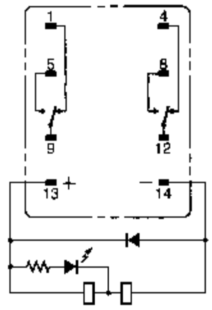
MY2N-CR/MY2IN-CR (AC Models Only)



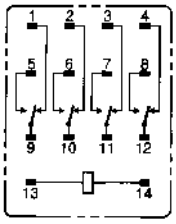
MY2N1/MY2IN1 (DC Models Only)



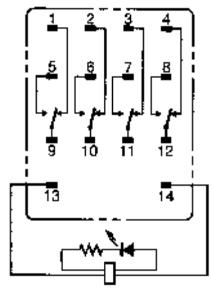
MY2N1-D2/MY2IN1-D2 (DC Models Only)



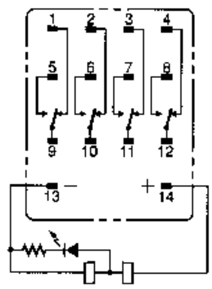
MY4(Z)



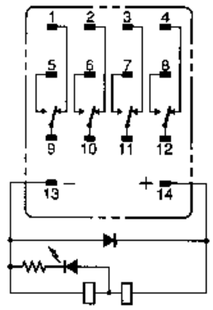
MY4(Z)N/MY4(Z)IN (AC Models)



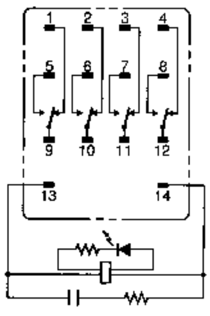
MY4(Z)N/MY4(Z)IN (DC Models)



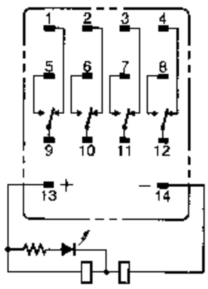
MY4(Z)N-D/MY4(Z)IN-D2 (DC Models Only)



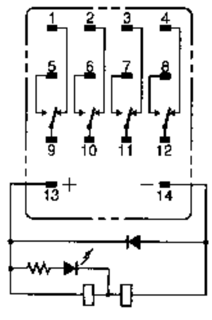
MY4(Z)N-CR/MY4(Z)IN-CR (AC Models Only)



MY4(Z)N1/MY4(Z)IN1 (DC Models Only)



MY4(Z)N1-D2/MY4(Z)IN1-D2 (DC Models Only)

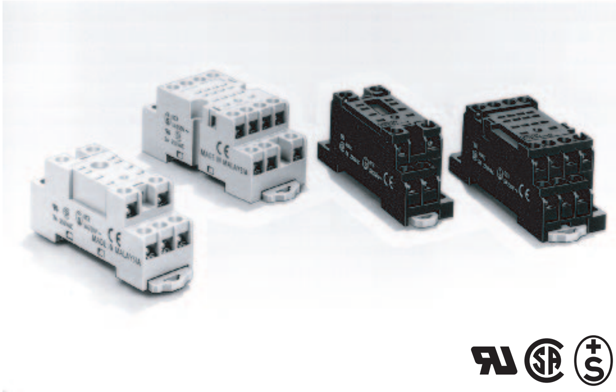


Note: The DC models have polarity.

Socket for MY

Track-mounted (DIN Track) Socket
Conforms to VDE 0106, Part 100

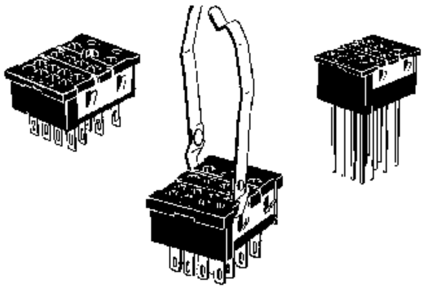
- Snap into position along continuous sections of any mounting track.
- Facilitates sheet metal design by standardized mounting dimensions.
- Design with sufficient dielectric separation between terminals eliminates the need of any insulating sheet.



■ Safety Standards for Sockets

Model	Standards	File No.
PYF08A-E, PYF08A-N PYF14A-E, PYF14A-N	UL508	E87929
	CSA22.2	LR31928

Back-connecting Sockets



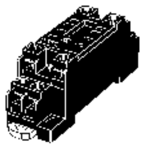
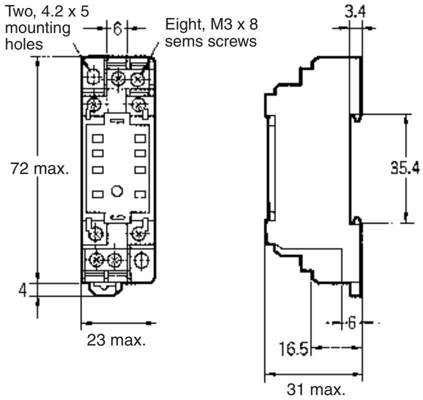
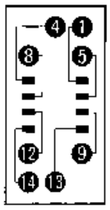
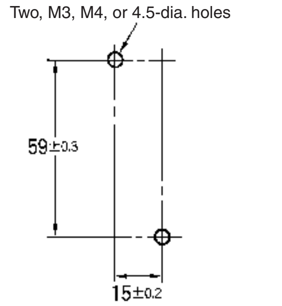
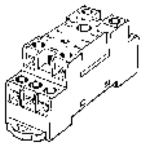
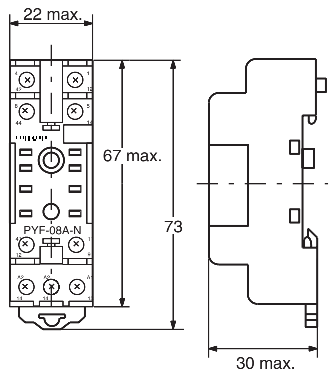
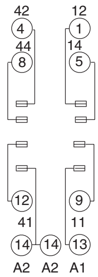
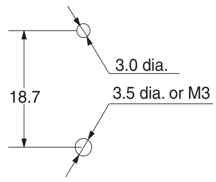
■ Specifications

Item	Pole	Model	Carry current	Dielectric withstand voltage	Insulation resistance (see note 2)
Track-mounted Socket	2	PYF08A-E	7 A	2,000 VAC, 1 min	1,000 MΩ min.
		PYF08A-N (see note 3)	7 A (see note 4)		
	4	PYF14A-E	5 A		
		PYF14A-N (see note 3)	5 A (see note 4)		
Back-connecting Socket	2	PY08(-Y1)	7 A	1,500 VAC, 1 min	100 MΩ min.
		PY08QN(-Y1)			
		PY08-02			
	4	PY14(-Y1)	3 A		
		PY14QN(-Y1)			
		PY14-02			

Note: 1. The values given above are initial values.
2. The values for insulation resistance were measured at 500 V at the same place as the dielectric strength.
3. The maximum operating ambient temperature for the PYF08A-N and PYF14A-N is 55°C.
4. When using the PYF08A-N or PYF14A-N at an operating ambient temperature exceeding 40°C, reduce the current to 60%.

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

<table>
<tr><th>Socket</th><th>Dimensions</th><th>Terminal arrangement/
Internal connections
(top view)</th><th>Mounting holes</th></tr>
<tr><td>PYF08A-E
</td><td></td><td></td><td>
(TOP VIEW)
Note: Track mounting is also possible. Refer to page 12 for supporting tracks.</td></tr>
<tr><td>PYF08A-N
</td><td></td><td></td><td>
Note: Track mounting is also possible. Refer to page 12 for supporting tracks.</td></tr>
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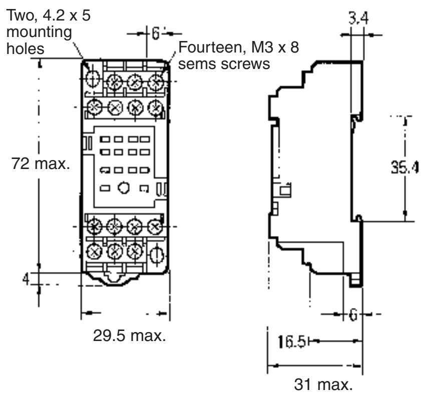
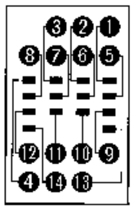
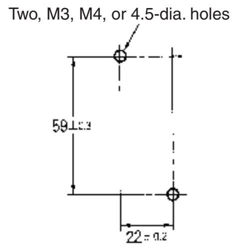
</td><td></td><td></td><td>
(TOP VIEW)
Note: Track mounting is also possible. Refer to page 12 for supporting tracks.</td></tr>
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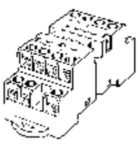
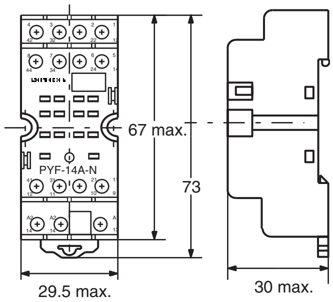
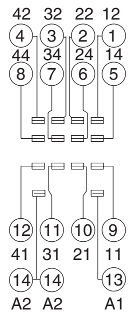
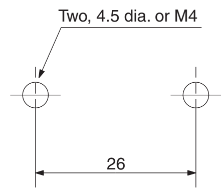
</td><td></td><td></td><td>
Note: Track mounting is also possible. Refer to page 12 for supporting tracks.</td></tr>
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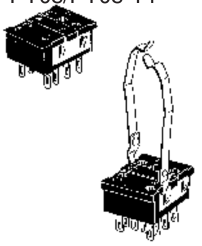
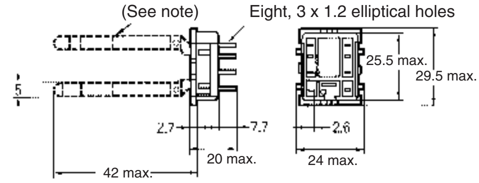
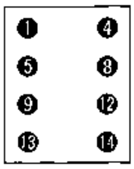
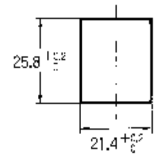
<table>
<tr><th>Socket</th><th>Dimensions</th><th>Terminal arrangement/ Internal connections (bottom view)</th><th>Mounting holes</th></tr>
<tr><td>PY08/PY08-Y1
</td><td>
Note: The PY08-Y1 includes sections indicated by dotted lines.</td><td rowspan="3"></td><td rowspan="2"></td></tr>
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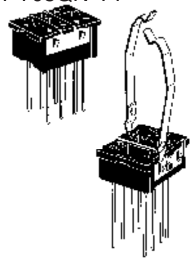
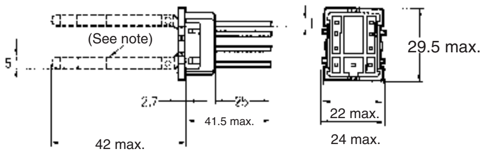
</td><td>
Note: The PY08QN-Y1 includes sections indicated by dotted lines.</td></tr>
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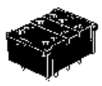
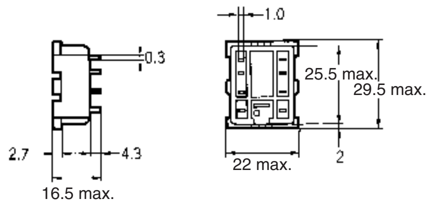
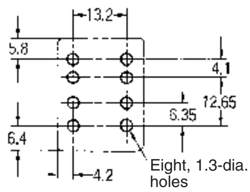
</td><td></td><td></td></tr>
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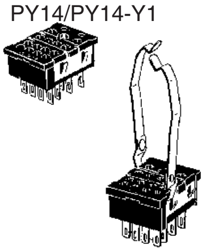
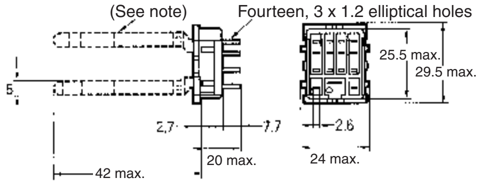
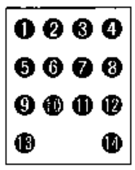
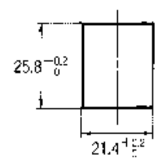
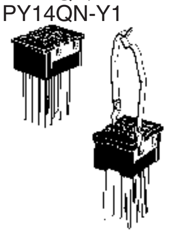
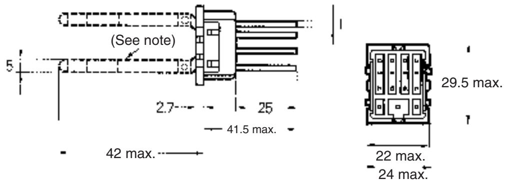
</td><td>
Note: The PY14-Y1 includes sections indicated by dotted lines.</td><td rowspan="3"></td><td rowspan="2"></td></tr>
<tr><td>PY14QN/
PY14QN-Y1
</td><td>
Note: The PY14QN-Y1 includes sections indicated by dotted lines.</td></tr>
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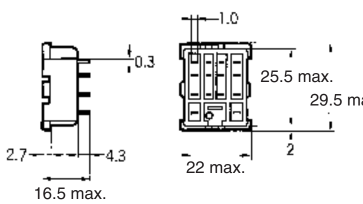
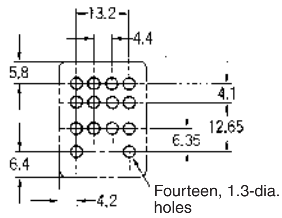
</td><td></td><td></td></tr>
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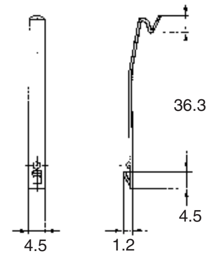
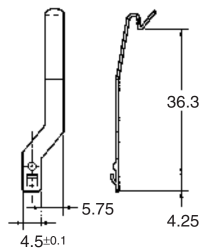
Note: Use a panel with plate thickness of 1 to 2 mm for mounting the Sockets.

Hold-down Clips

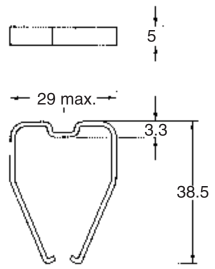
PYC-A1
(2 pcs per set)



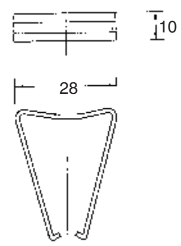
PYC-E1
(2 pcs per set)



PYC-P

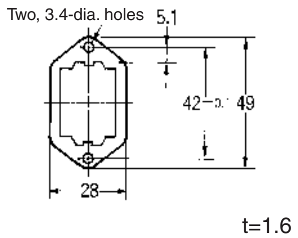


PYC-P2

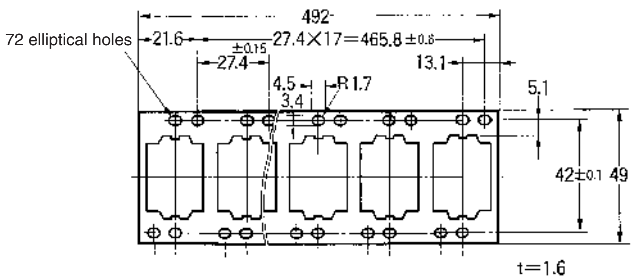


Mounting Plates for Back-connecting Sockets

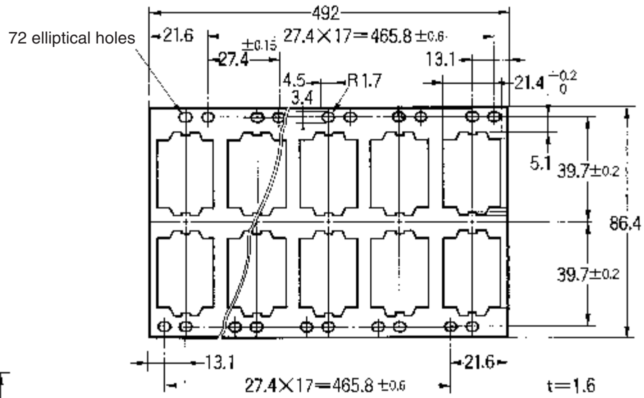
PYP-1



PYP-18



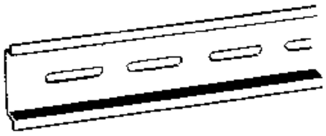
PYP-36

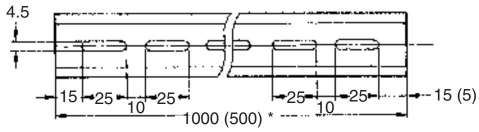


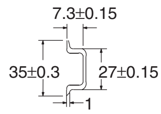
Tracks and Accessories

Supporting Tracks

PFP-50N/PFP-100N

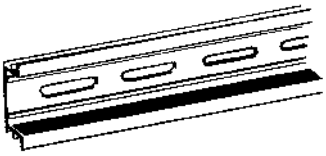


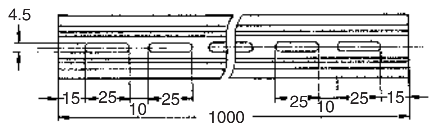


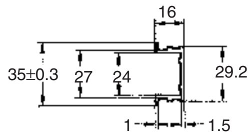


Note: The figure in the parentheses is for PFP-50N.

PFP-100N2

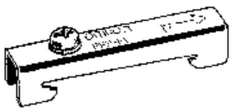


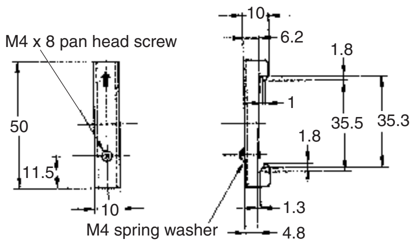




End Plate

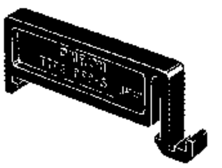
PFP-M

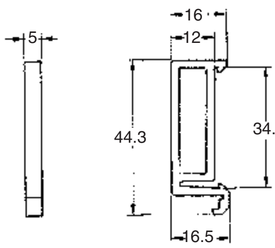




Spacer

PFP-S





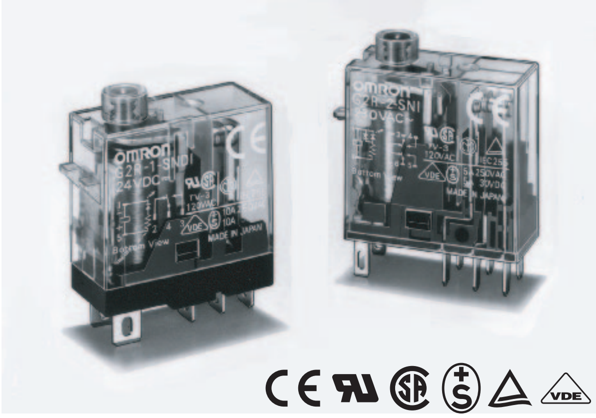
ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. J111-E1-02

General-purpose Relay
G2RS

The New-generation General-purpose Relay

- Reliable and unique test button models now available.
- High switching power (1-pole: 10 A)
- Highly functional Socket also available.
- Space-saving (29 (H) x 13 (W) x 29 (D))
- Conforms to UL508, CSA22.2, VDE0435 (C250 insulation grade).
- 8-mm creepage distance / 8-mm air distance



Model Number Structure

■ Model Number Legend

G2R □ -□ □ □ - □ □ -□
1 2 3 4 5 6 7

1. Relay Function
Blank: General-purpose

2. Number of Poles
1: 1 pole
2: 2 poles

3. Contact Form
Blank: SPDT
A: SPST-NO

4. Contact Type
Blank: Single
3: Bifurcated crossbar

5. Terminals
S: Plug-in

6. Classification
Blank: General-purpose
N: LED indicator
D: Diode
ND: LED indicator and diode
I: Test button

7. Rated Coil Voltage

Ordering Information

■ List of Models

Classification		Enclosure rating	Coil ratings	Contact form			
				SPST-NO	SPDT	DPST-NO	DPDT
Plug-in terminal	General-purpose	Unsealed	AC/DC	---	G2R-1-S	---	G2R-2-S
	LED indicator			---	G2R-1-SN	---	G2R-2-SN
	LED indicator with test button			---	G2R-1-SNI	---	G2R-2-SNI
	Diode		DC	---	G2R-1-SD	---	G2R-2-SD
	LED indicator and diode			---	G2R-1-SND	---	G2R-2-SND
	LED indicator and diode with test button			---	G2R-1-SNDI	---	G2R-2-SNDI
Plug-in terminal (Bifurcated crossbar contact)	General-purpose		AC/DC	G2R-1A3-S	G2R-13-S	---	---
	LED indicator			G2R-1A3-SN	G2R-13-SN	---	---
	LED indicator and diode		DC	G2R-1A3-SND	G2R-13-SND	---	---

Note: When ordering, add the rated coil voltage to the model number.
Example: G2R-1-S 12 VDC
Rated coil voltage

■ Accessories (Order Separately)

Connecting Sockets

Number of poles	Applicable Relay model	Track/surface-mounting Socket	Back-mounting Socket	
			Terminals	Model
1 pole	G2R-1-S(N)(D)(ND)(NI)(NDI)G2R-13-S (G2R-1A3-S)	P2RF-05-E P2RF-05	PCB terminals	P2R-05P, P2R-057P
			Solder terminals	P2R-05A
2 poles	G2R-2-S(N)(D)(ND)(NI)(NDI)	P2RF-08-E P2RF-08	PCB terminals	P2R-08P, P2R-087P
			Solder terminals	P2R-08A

Note: See *Dimensions* for details on Socket size.

Mounting Tracks

Applicable Socket	Description	Model
Track-connecting Socket	Mounting track	50 cm (ℓ) x 7.3 mm (t): PFP-50N 1 m (ℓ) x 7.3 mm (t): PFP-100N 1 m (ℓ) x 16 mm (t): PFP-100N2
	End plate	PFP-M
	Spacer	PFP-S
Back-connecting Socket	Mounting plate	P2R-P*

*Used to mount several P2R-05A and P2R-08A Connecting Sockets side by side.

Specifications

■ Coil Ratings

Rated voltage		Rated current*		Coil resistance*	Coil inductance (H) (ref. value)		Must operate voltage	Must release voltage	Max. voltage	Power consumption (approx.)
		50 Hz	60 Hz		Armature OFF	Armature ON	% of rated voltage			
AC	12 V	93 mA	75 mA	65 Ω	0.19	0.39	80% max.	30% max.	110%	0.9 VA at 60 Hz (0.7 VA at 60 Hz) (see note)
	24 V	46.5 mA	37.5 mA	260 Ω	0.81	1.55				
	100/ (110) V	11 mA	9/ (10.6) mA	4,600 Ω	13.34	26.84				
	120 V	9.3 mA	7.5 mA	6,500 Ω	21	42				
	200/ (220) V	5.5/4.0 mA	4.5/ (5.3) mA	20,200/ (25,000) Ω	51.3	102				
	220 V	5.1 mA	4.1 mA	25,000 Ω	57.5	117				
	230 V	4.7/ (3.7) mA	3.8/ (3.1) mA	26,850/ (30,000) Ω	62	124				
	240 V	4.7 mA	3.8 mA	30,000 Ω	65.5	131				

Note: 1. Rated voltage of bifurcated crossbar contact type: 100/(110) VAC, 200/(220) VAC, 230 VAC (Approx. 0.7 VA at 60 Hz)
2. Depending on the type of Relay, some Relays do not have coil specifications. Contact your OMRON representative for more details.

Rated voltage		Rated current*	Coil resistance*	Coil inductance (H) (ref. value)		Must operate voltage	Must release voltage	Max. voltage	Power consumption (approx.)
		50/60 Hz		Armature OFF	Armature ON	% of rated voltage			
DC	5 V	106 mA	47 Ω	0.20	0.39	70% max.	15% min.	110%	0.53 W
	6 V	88.2 mA	68 Ω	0.28	0.55				
	12 V	43.6 mA	275 Ω	1.15	2.29				
	24 V	21.8 mA	1,100 Ω	4.27	8.55				
	48 V	11.5 mA	4,170 Ω	13.86	27.71				
	100 V	5.3 mA	18,860 Ω	67.2	93.2				

Note: Rated voltage of bifurcated crossbar contact type: 12 VDC, 24 VDC

■ Contact Ratings

Plug-in Terminal Relays

Number of poles	1 pole		2 poles	
Load	Resistive load (cosϕ = 1)	Inductive load (cosϕ = 0.4; L/R = 7 ms)	Resistive load (cosϕ = 1)	Inductive load (cosϕ = 0.4; L/R = 7 ms)
Rated load	10 (1) A at 250 VAC; 10 (1) A at 30 VDC	7.5 A at 250 VAC; 5 A at 30 VDC	5 A at 250 VAC; 5 A at 30 VDC	2 A at 250 VAC; 3 A at 30 VDC
Rated carry current	10 (1) A		5 A	
Max. switching voltage	380 VAC, 125 VDC		380 VAC, 125 VDC	
Max. switching current	10 (1) A		5 A	
Max. switching power	2,500 (250) VA, 300 (30) W	1,875 VA, 150 W	1,250 VA, 150 W	500 VA, 90 W
Failure rate (reference value)	100 mA at 5 VDC (1 mA at 5 VDC)		10 mA at 5 VDC	

Note: 1. P level: λ_{60} = 0.1 x 10^{-6}/operation
2. ( ): Bifurcated crossbar contact type.

■ Characteristics

Standard Relays

Item	1 pole	2 poles
Contact resistance	30 mΩ max.	50 mΩ max.
Operate (set) time	15 ms max.	
Release (reset) time	AC: 10 ms max.; DC: 5 ms max. (w/built-in diode: 20 ms max.)	
Max. operating frequency	Mechanical: 18,000 operations/hr Electrical: 1,800 operations/hr (under rated load)	
Insulation resistance	1,000 MΩ min. (at 500 VDC)	
Dielectric strength	5,000 VAC, 50/60 Hz for 1 min between coil and contacts*; 1,000 VAC, 50/60 Hz for 1 min between contacts of same polarity	5,000 VAC, 50/60 Hz for 1 min between coil and contacts*; 3,000 VAC, 50/60 Hz for 1 min between contacts of different polarity 1,000 VAC, 50/60 Hz for 1 min between contacts of same polarity
Vibration resistance	Destruction: 10 to 55 to 10 Hz, 0.75 mm single amplitude (1.5 mm double amplitude) Malfunction: 10 to 55 to 10 Hz, 0.75 mm single amplitude (1.5 mm double amplitude)	
Shock resistance	Destruction: 1,000 m/s^2 Malfunction: 200 m/s^2 when energized; 100 m/s^2 when not energized	
Endurance	Mechanical: AC coil: 10,000,000 operations min.; DC coil: 20,000,000 operations min. (at 18,000 operations/hr) Electrical: 100,000 operations min. (at 1,800 operations/hr under rated load)	
Ambient temperature	Operating: –40°C to 70°C (with no icing)	
Ambient humidity	Operating: 5% to 85%	
Weight	Approx. 17 g (plug-in terminal: approx. 20 g)	

Note: Values in the above table are the initial values.
*2,000 VAC, 50/60 Hz for 1 minute when the P2R-05A or P2R-08A Socket is mounted.

■ Approved Standards

UL 508 (File No. E41643)

Model	Contact form	Coil ratings	Contact ratings	Operations
G2R-1-S	SPDT	5 to 110 VDC 5 to 240 VAC	10 A, 30 VDC (resistive) 10 A, 250 VAC (general use) TV-3 (NO contact only)	6×10^3
G2R-1A-S	SPST-NO			25×10^3
G2R-2-S	DPDT		5 A, 30 VDC (resistive) 5 A, 250 VAC (general use) TV-3 (NO contact only)	6×10^3
				25×10^3

CSA 22.2 No.0, No.14 (File No. LR31928)

Model	Contact form	Coil ratings	Contact ratings	Operations
G2R-1-S	SPDT	5 to 110 VDC 5 to 240 VAC	10 A, 30 VDC (resistive) 10 A, 250 VAC (general use) TV-3 (NO contact only)	6×10^3
G2R-1A-S	SPST-NO			25×10^3
G2R-2-S	DPDT		5 A, 30 VDC (resistive) 5 A, 250 VAC (general use) TV-3 (NO contact only)	6×10^3
				25×10^3

SEV (SEV 1025-1, IEC 158-1)

Contact form	Coil ratings	Contact ratings
1 pole	5 to 110 VDC 5 to 240 VAC	10 A, 250 VAC1 5 A, 250 VAC3 10 A, 30 VDC1
2 poles	5 to 110 VDC 5 to 240 VAC	5 A, 250 VAC1 2 A, 380 VAC1 5 A, 30 VDC1

TÜV (IEC 255, VDE 0435)

Contact form	Coil ratings	Contact ratings	Operations
1 pole	3 to 110 VDC, 6 VAC to 240 VAC (for Standards coil)	10 A, 250 VAC ($\cos\phi$ = 1.0) 10 A, 30 VDC (0 ms)	100×10^3
2 poles		5 A, 250 VAC ($\cos\phi$ =1.0) 5 A, 30 VDC (0 ms) 2.5 A, 250 VAC ($\cos\phi$ = 0.4)	100×10^3

VDE (IEC 255, VDE 0435)

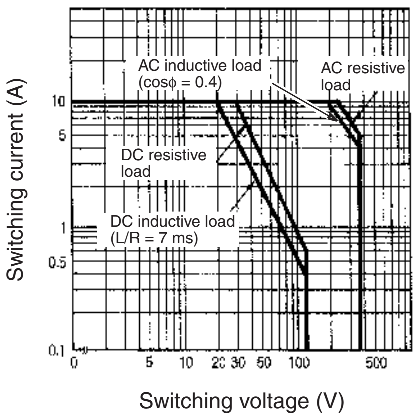
Contact form	Coil ratings	Contact ratings	Operations
1 pole	5, 6, 9, 12, 18, 24, 48, 60, 100, 110 VDC 12, 18, 24, 48, 50, 100/(110), 110, 120, 200/(220), 220, 230, 240 VAC	10 A, 250 VAC ($\cos\phi$ = 1.0) 10 A, 30 VDC (0 ms)	100×10^3
2 poles	5, 6, 9, 12, 18, 24, 48, 60, 100, 110 VDC 12, 18, 24, 48, 50, 100/(110), 110, 120, 200/(220), 220, 230, 240 VAC	5 A, 250 VAC ($\cos\phi$ =1.0) 5 A, 30 VDC (0 ms)	100×10^3

Engineering Data

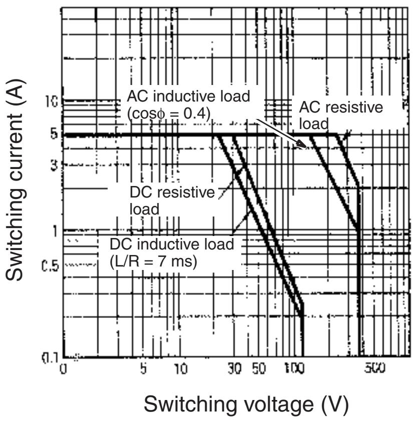
Maximum Switching Power

Plug-in Relays

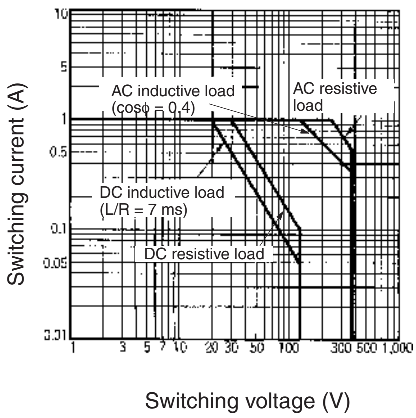
G2R-1-S



G2R-2-S



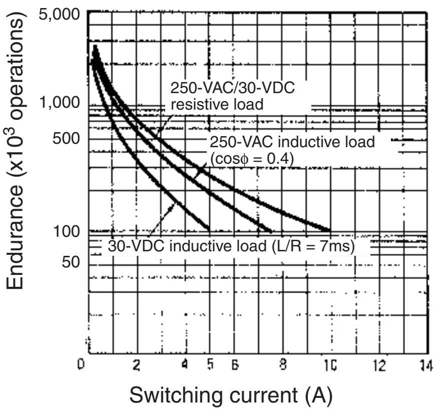
G2R-13-S, G2R-1A3-S



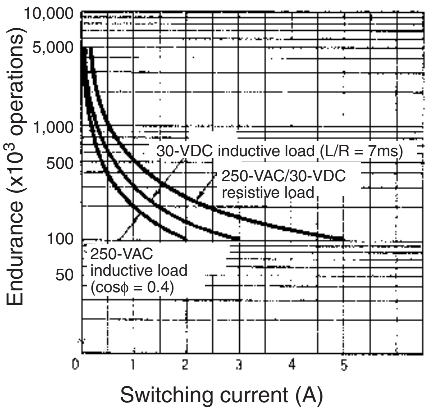
Endurance

Pulg-in Relays

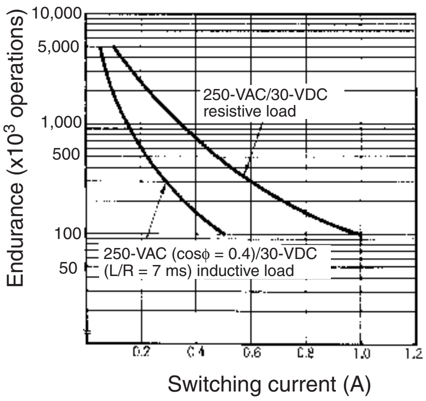
G2R-1-S



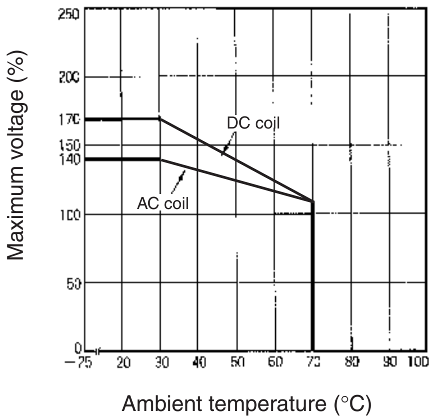
G2R-2-S



G2R-13-S, G2R-1A3-S



Ambient Temperature vs Maximum Coil Voltage



Note: The maximum voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

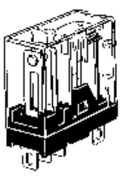
Dimensions

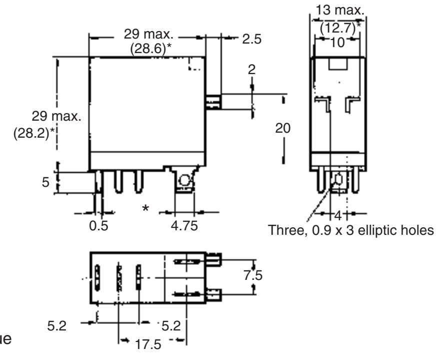
Note: 1. All units are in millimeters unless otherwise indicated.
2. Orientation marks are indicated as follows:

Relays with Plug-in Terminals

SPDT Relays

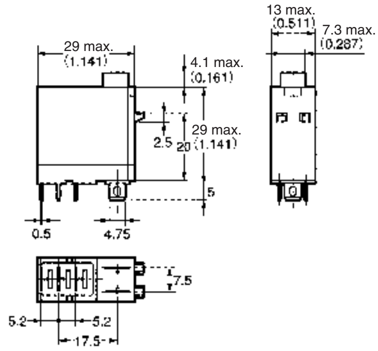
G2R-1-S, G2R-1-SD, G2R-1-SN, G2R-1-SND, G2R-1-SNI, G2R-1-SNDI
G2R-13-S, G2R-13-SD, G2R-13-SN, G2R-13-SND





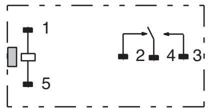
*This terminal is SPDT only.

*Average value

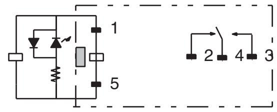


Terminal Arrangement/Internal Connections (Bottom View)

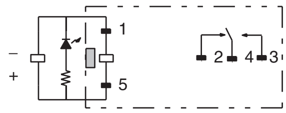
G2R-1-S, G2R-13-S



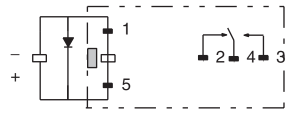
G2R-1-SN, G2R-1-SNI, G2R-13-SN (AC)



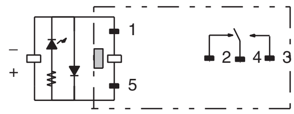
G2R-1-SN, G2R-1-SNI, G2R-13-SN (DC)



G2R-1-SD, G2R-13-SD (DC)



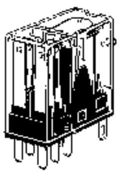
G2R-1-SND, G2R-1-SNDI, G2R-13-SND (DC)

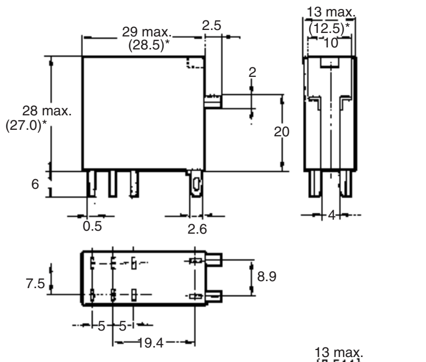


(After confirming coil polarity, wire correctly.) (Except G2R-1-S, G2R-13-S)

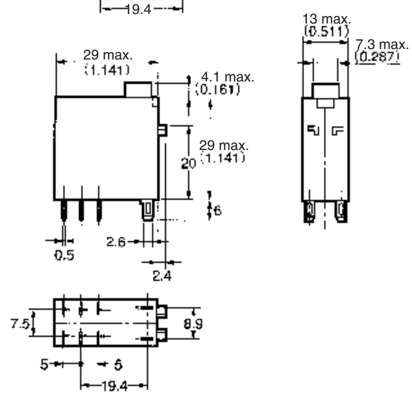
DPDT Relays

G2R-2-S, G2R-2-SD, G2R-2-SN, G2R-2-SNI, G2R-2-SNDI
G2R-2-SND



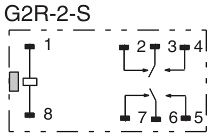


*Average value

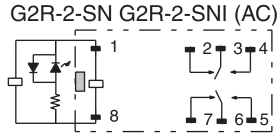


Terminal Arrangement/Internal Connections (Bottom View)

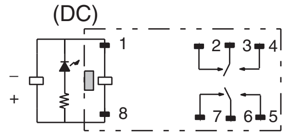
G2R-2-S



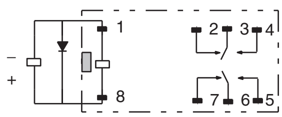
G2R-2-SN G2R-2-SNI (AC)



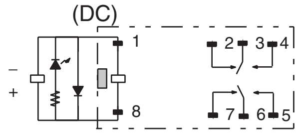
G2R-2-SN G2R-2-SNI (DC)



G2R-2-SD (DC)



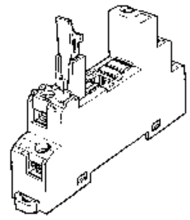
G2R-2-SND G2R-2-SNDI (DC)

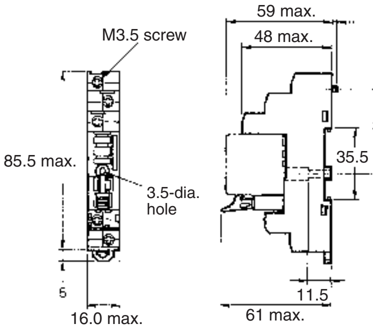


(After confirming coil polarity, wire correctly.)

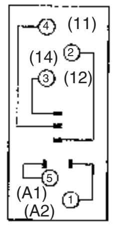
Track/Surface Mounting Sockets

P2RF-05-E

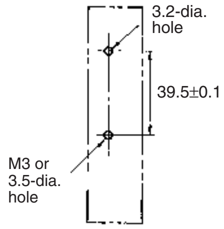




Terminal Arrangement (Top View)

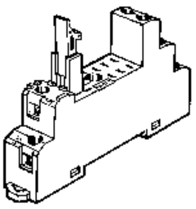


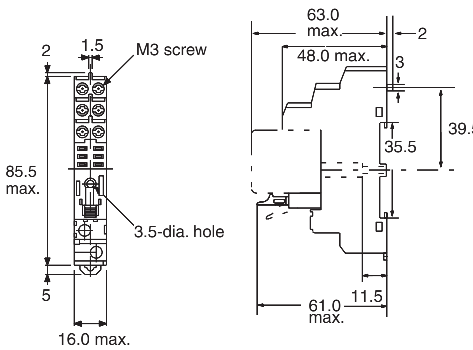
Mounting Holes (for Surface Mounting)



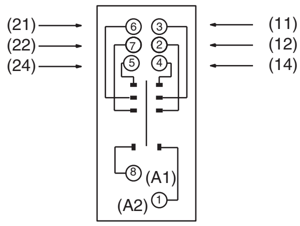
Note: Pin numbers in parentheses apply to DIN standard.

P2RF-08-E

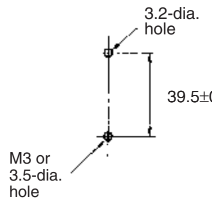




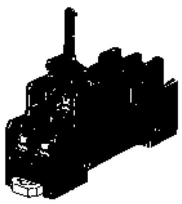
Terminal Arrangement (Top View)

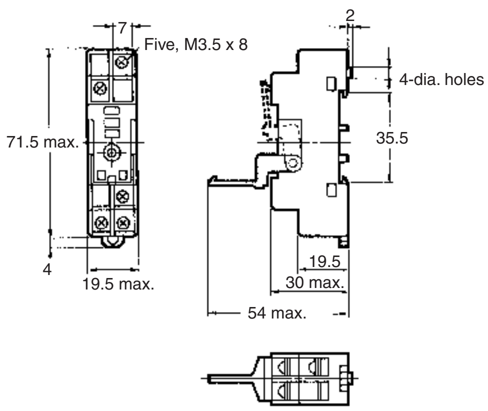


Mounting Holes (for Surface Mounting)

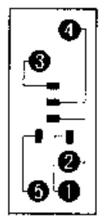


P2RF-05

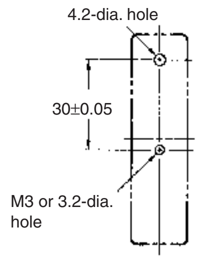




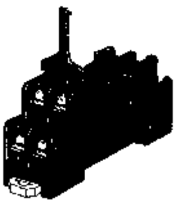
Terminal Arrangement (Top View)

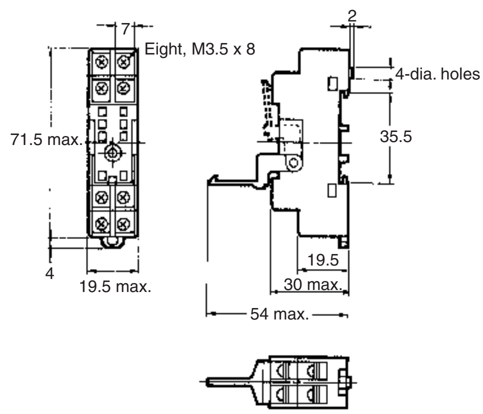


Mounting Holes (for Surface Mounting)

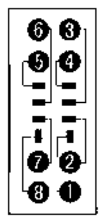


P2RF-08

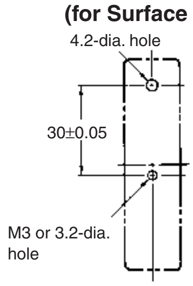




Terminal Arrangement (Top View)

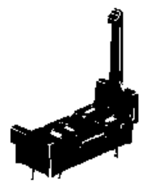


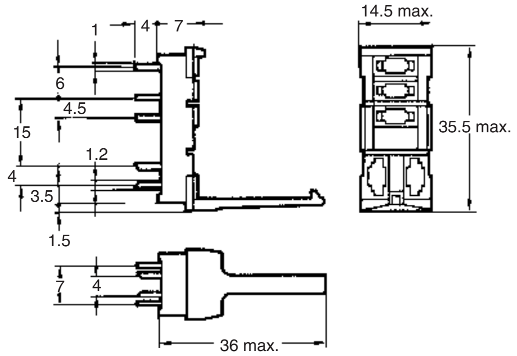
Mounting Holes (for Surface Mounting)



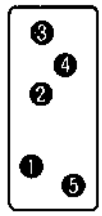
Back-connecting Sockets

P2R-05P (1-pole)



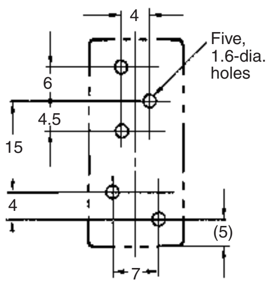


Terminal Arrangement (Bottom View)

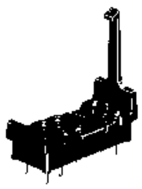


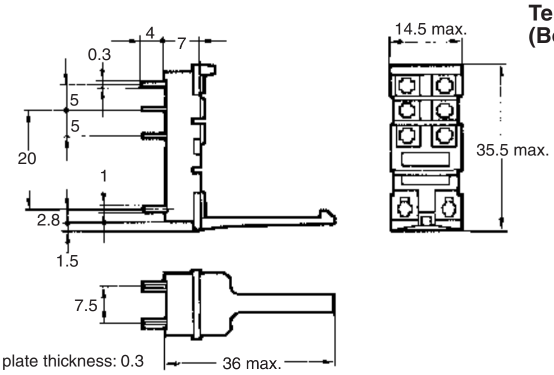
Mounting Holes

Tolerance: ±0.1



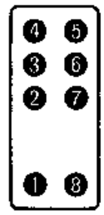
P2R-08P (2-pole)



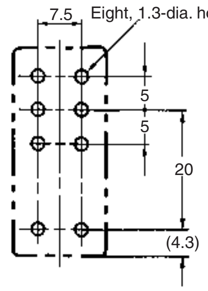


Terminal plate thickness: 0.3

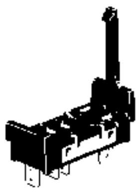
Terminal Arrangement (Bottom View)

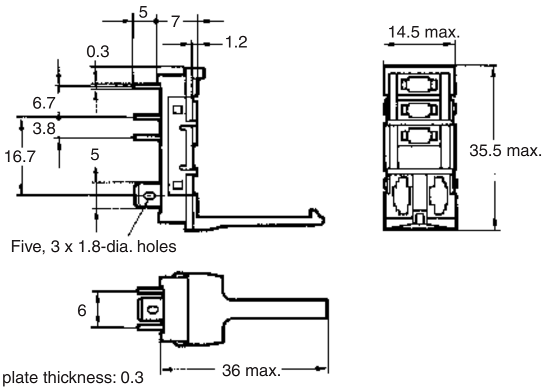


Mounting Holes



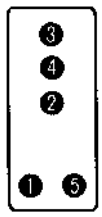
P2R-05A (1-pole)



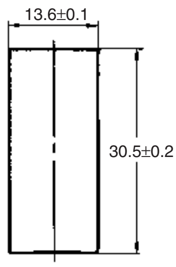


Terminal plate thickness: 0.3

Terminal Arrangement (Bottom View)

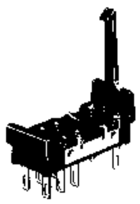


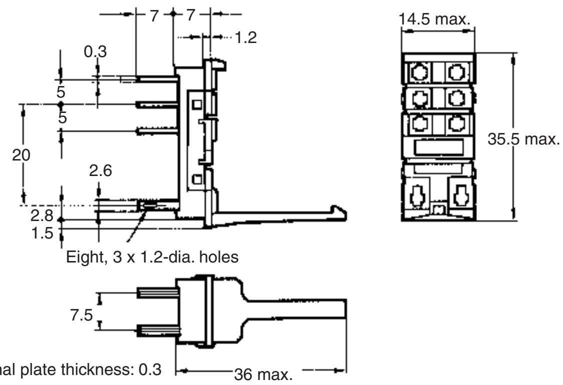
Panel Cutout



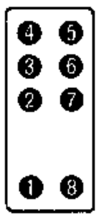
Recommended thickness of the panel is 1.6 to 2.0 mm

P2R-08A (2-pole)

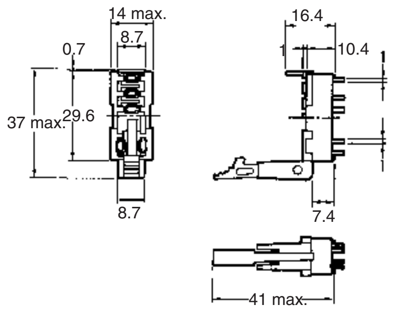




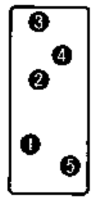
Terminal plate thickness: 0.3



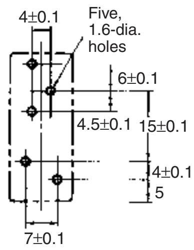
P2R-057P



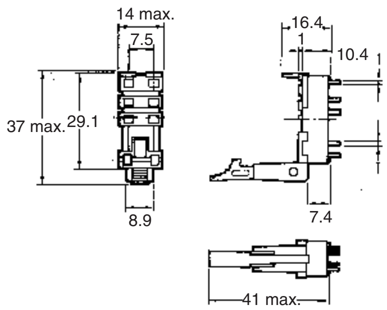
Terminal Arrangement (Bottom View)



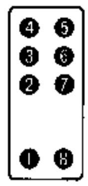
Mounting Holes



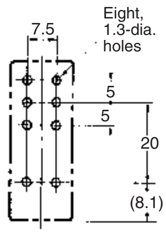
P2R-087P



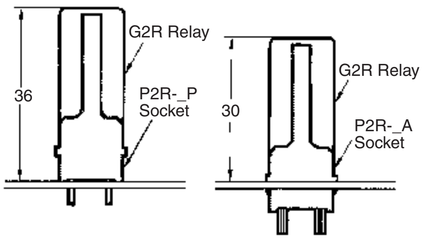
Terminal Arrangement (Bottom View)



Mounting Holes

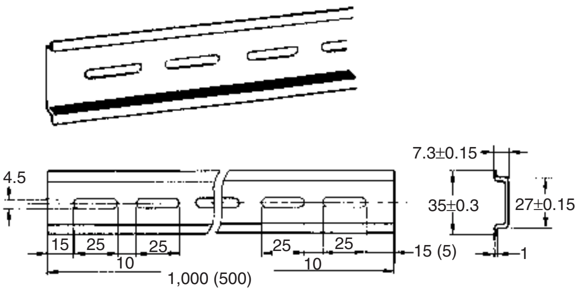


Mounting Height of Relay with Socket

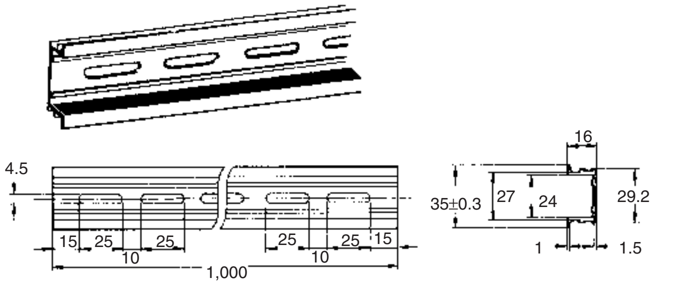


Mounting Tracks

PFP-100N, PFP-50N



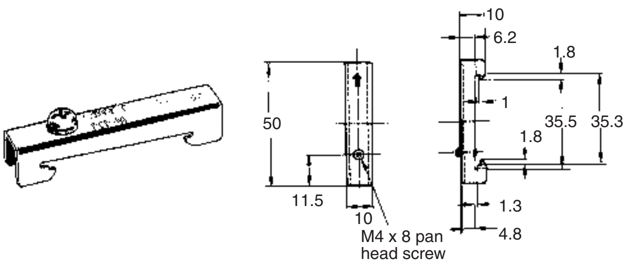
PFP-100N2



It is recommended to use a panel 1.6 to 2.0 mm thick.

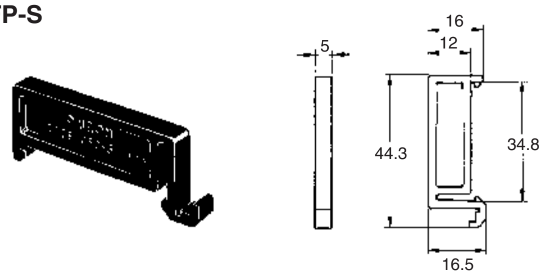
End Plate

PFP-M



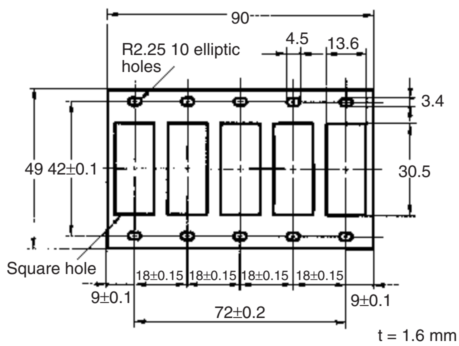
Spacer

PFP-S



Mounting Plate for Back-connecting Socket

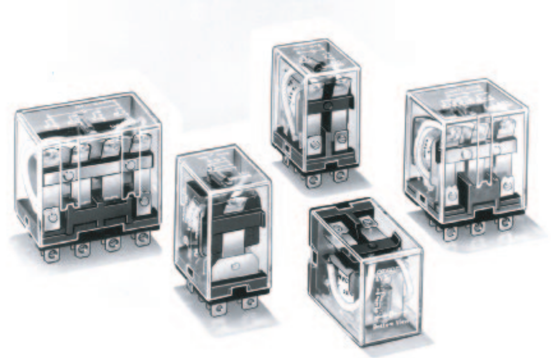
P2R-P



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

General-purpose Relay
LY

A Miniature Power Relay



- Equipped with arc barrier.
- Dielectric strength: 2,000 V.
- Built-in diode models added to the LY Series.
- Single-pole and double-pole models are applicable to operating coils with ratings of 100/110 VAC, 110/120 VAC, 200/220 VAC, 220/240 VAC, or 100/110 VDC).
- Three-pole and four-pole models are applicable to operating coils with ratings of 100/110 VAC, 200/220 VAC, or 100/110 VDC).

LR

Ordering Information

■ Open Relays

Type	Contact form	Plug-in/solder terminals	Plug-in/solder terminals with LED indicator	PCB terminals	Upper-mounting Plug-in/solder terminals
Standard	SPDT	LY1	LY1N	LY1-0	LY1F
	DPDT	LY2	LY2N	LY2-0	LY2F
	DPDT (bifurcated)	LY2Z	LY2ZN	LY2Z-0	LY2ZF
	3PDT	LY3	LY3N	LY3-0	LY3F
	4PDT	LY4	LY4N	LY4-0	LY4F
With built-in diode (DC only)	SPDT	LY1-D	LY1N-D2	---	---
	DPDT	LY2-D	LY2N-D2	---	---
	DPDT (bifurcated)	LY2Z-D	LY2ZN-D2	---	---
	3PDT	LY3-D	---	---	---
	4PDT	LY4-D	LY4N-D2	---	---
With built-in CR (AC only)	SPDT	---	---	---	---
	DPDT	LY2-CR	LY2N-CR	---	---
	DPDT (bifurcated)	LY2Z-CR	LY2ZN-CR	---	---

Note: 1. When ordering, add the rated coil voltage to the model number. Rated coil voltages are given in the coil ratings table.

Example: LY2, 6 VAC
Rated coil voltage

2. Relays with #187 quick connect terminals are also available with SPDT and DPDT contact. Ask your OMRON representative for details.
3. SEV models are standard Relays excluding DPDT (bifurcated) models.
4. VDE- or LR- qualifying Relays must be specified when ordering.

■ Accessories (Order Separately)

Sockets

Poles	Front-connecting Socket	Back-connecting Socket		
	DIN track/screw terminals	Plug-in/solder terminals	Wrapping terminals	PCB terminals
1 or 2	PTF08A-E, PTF08A	PT08	PT08QN	PT08-0
3	PTF11A	PT11	PT11QN	PT11-0
4	PTF14A-E, PTF14A	PT14	PT14QN	PT14-0

Note: 1. For PTF08-E and PTF14A-E, see "Track Mounted Socket."
2. PTF□A (-E) Sockets have met UL and CSA standards: UL 508/CSA C22.2.

Mounting Plates for Sockets

Socket model	For 1 Socket	For 10 Sockets	For 12 Sockets	For 18 Sockets
PT08 PT08QN	PYP-1	---	---	PYP-18
PT11 PT11QN	PTP-1-3	---	PTP-12	---
PT14 PT14QN	PTP-1	PTP-10	---	---

Socket-Hold-down Clip Pairings

Relay type	Poles	Front-connecting Sockets		Back-connecting Sockets	
		Socket model	Clip model	Socket model	Clip model
Standard, bifurcated contacts operation indicator, built-in diode	1, 2	PTF08A-E, PTF08A	PYC-A1	PT08(QN), PT08-0	PYC-P
	3	PTF11A		PT11(QN), PT11-0	
	4	PTF14A-E, PTF14A		PT14(QN), PT14-0	
CR circuit	2	PTF08A-E, PTF08A	Y92H-3	PT08(QN), PT08-0	PYC-1

Specifications

■ Coil Ratings

Single- and Double-pole Relays

Rated voltage		Rated current		Coil resistance	Coil inductance (reference value)		Must operate voltage	Must release voltage	Max. voltage	Power consum. (approx.)
		50 Hz	60 Hz		Arm. OFF	Arm. ON	% of rated voltage			
AC	6 V	214.1 mA	183 mA	12.2 Ω	0.04 H	0.08 H	80% max.	30% min.	110%	1.0 to 1.2 VA (60 Hz)
	12 V	106.5 mA	91 mA	46 Ω	0.17 H	0.33 H				
	24 V	53.8 mA	46 mA	180 Ω	0.69 H	1.30 H				
	50 V	25.7 mA	22 mA	788 Ω	3.22 H	5.66 H				
	100/110 V	11.7/12.9 mA	10/11 mA	3,750 Ω	14.54 H	24.6 H				0.9 to 1 VA (60 Hz)
	110/120 V	9.9/10.8 mA	8.4/9.2 mA	4,430 Ω	19.20 H	32.1 H				
	200/220 V	6.2/6.8 mA	5.3/5.8 mA	12,950 Ω	54.75 H	94.07 H				
	220/240 V	4.8/5.3 mA	4.2/4.6 mA	18,790 Ω	83.50 H	136.40 H				
DC	6 V	150 mA		40 Ω	0.16 H	0.33 H		10% min.		0.9 W
	12 V	75 mA		160 Ω	0.73 H	1.37 H				
	24 V	36.9 mA		650 Ω	3.20 H	5.72 H				
	48 V	18.5 mA		2,600 Ω	10.6 H	21.0 H				
	100/110 V	9.1/10 mA		11,000 Ω	45.6 H	86.2 H				

Note: See notes on the bottom of next page.

Three-pole Relays

Rated voltage		Rated current 50 Hz	Rated current 60 Hz	Coil resistance	Coil inductance (reference value) Arm. OFF	Coil inductance (reference value) Arm. ON	Must operate voltage (% of rated voltage)	Must release voltage (% of rated voltage)	Max. voltage (% of rated voltage)	Power consum. (approx)
AC	6 V	310 mA	270 mA	6.7 Ω	0.03 H	0.05 H	80% max.	30% min.	110%	1.6 to 2.0 VA (60 Hz)
	12 V	159 mA	134 mA	24 Ω	0.12 H	0.21 H				
	24 V	80 mA	67 mA	100 Ω	0.44 H	0.79 H				
	50 V	38 mA	33 mA	410 Ω	2.24 H	3.87 H				
	100/110 V	14.1/16 mA	12.4/13.7 mA	2,300 Ω	10.5 H	18.5 H				
	200/220 V	9.0/10.0 mA	7.7/8.5 mA	8,650 Ω	34.8 H	59.5 H				
DC	6 V	234 mA		25.7 Ω	0.11 H	0.21 H		10% min.		1.4 W
	12 V	112 mA		107 Ω	0.45 H	0.98 H				
	24 V	58.6 mA		410 Ω	1.89 H	3.87 H				
	48 V	28.2 mA		1,700 Ω	8.53 H	13.9 H				
	100/110 V	12.7/13 mA		8,500 Ω	29.6 H	54.3 H				

Note: See notes under next table.

Four-pole Relays

Rated voltage		Rated current 50 Hz	Rated current 60 Hz	Coil resistance	Coil inductance (reference value) Arm. OFF	Coil inductance (reference value) Arm. ON	Must operate voltage (% of rated voltage)	Must release voltage (% of rated voltage)	Max. voltage (% of rated voltage)	Power consum. (approx)
AC	6 V	386 mA	330 mA	5 Ω	0.02 H	0.04 H	80% max.	30% min.	110%	1.95 to 2.5 VA (60 Hz)
	12 V	199 mA	170 mA	20 Ω	0.10 H	0.17 H				
	24 V	93.6 mA	80 mA	78 Ω	0.38 H	0.67 H				
	50 V	46.8 mA	40 mA	350 Ω	1.74 H	2.88 H				
	100/110 V	22.5/25.5 mA	19/21.8 mA	1,600 Ω	10.5 H	17.3 H				
	200/220 V	11.5/13.1 mA	9.8/11.2 mA	6,700 Ω	33.1 H	57.9 H				
DC	6 V	240 mA		25 Ω	0.09 H	0.21 H		10% min.		1.5 W
	12 V	120 mA		100 Ω	0.39 H	0.84 H				
	24 V	69 mA		350 Ω	1.41 H	2.91 H				
	48 V	30 mA		1,600 Ω	6.39 H	13.6 H				
	100/110 V	15/15.9 mA		6,900 Ω	32 H	63.7 H				

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with tolerances of +15%/–20% for rated currents and ±15% for DC coil resistance.

2. Performance characteristic data are measured at a coil temperatures of 23°C.

3. AC coil resistance and impedance are provided as reference values (at 60 Hz).

4. Power consumption drop was measured for the above data. When driving transistors, check leakage current and connect a bleeder resistor if required.

■ Contact Ratings

Relay	Single contact				Bifurcated contacts	
	1-pole		2-, 3- or 4-pole		2-pole	
Load	Resistive load (cosϕ = 1)	Inductive load (cosϕ=0.4, L/R=7 ms)	Resistive load (cosϕ = 1)	Inductive load (cosϕ=0.4, L/R=7 ms)	Resistive load (cosϕ = 1)	Inductive load (cosϕ=0.4, L/R=7 ms)
Rated load	110 VAC 15 A 24 VDC 15 A	110 VAC 10 A 24 VDC 7 A	110 VAC 10 A 24 VDC 10 A	110 VAC 7.5 A 24 VDC 5 A	110 VAC 5A 24 VDC 5 A	110 VAC 4 A 24 VDC 4A
Rated carry current	15 A		10 A		7 A	
Max. switching voltage	250 VAC 125 VDC		250 VAC 125 VDC		250 VAC 125 VDC	
Max. switching current	15 A		10 A		7 A	
Max. switching power	1,700 VA 360 W	1,100 VA 170 W	1,100 VA 240 W	825 VA 120 W	550 VA 120 W	440 VA 100 W
Failure rate (reference value)*	100 mA, 5 VDC		100 mA, 5 VDC		10 mA, 5 VDC	

***Note:** P level: λ_{60} = 0.1 x 10^{-6}/operation, reference value

■ Characteristics

Item	All except Relays with bifurcated contacts	Relays with bifurcated contacts
Contact resistance	50 mΩ max.	
Operate time	25 ms max.	
Release time	25 ms max.	
Max. operating frequency	Mechanical: 18,000 operations/hr Electrical: 1,800 operations/hr (under rated load)	
Insulation resistance	100 MΩ min. (at 500 VDC)	
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min between contacts of same polarity 2,000 VAC, 50/60 Hz for 1 min between contacts of different polarity	
Vibration resistance	Destruction: 10 to 55 to 10 Hz, 0.5 mm single amplitude (1.0 mm double amplitude) Malfunction: 10 to 55 to 10 Hz, 0.5 mm single amplitude (1.0 mm double amplitude)	
Shock resistance	Destruction: 1,000 m/s² Malfunction: 200 m/s²	
Endurance	Mechanical: AC: 50,000,000 operations min. (at 18,000 operations/hr) DC: 1,00,000,000 operations min. (at 18,000 operations/hr) Electrical: Single-, three-, and four-pole: 200,000 operations min. (at 1,800 operations/hr under rated load) Double-pole: 500,000 operations min. (at 1,800 operations/hr under rated load)	
Ambient temperature*	Operating: Single- and double-pole standard, bifurcated-contact Relays: –25°C to 55°C (with no icing) (–25°C to 70°C if carry current is 4 A or less) All other Relays: –25°C to 40°C (with no icing) (–25°C to 55°C if carry current is 4 A or less)	
Ambient humidity	Operating: 5% to 85%	
Weight	Single- and double-pole: approx. 40 g, three-pole: approx. 50 g, four-pole: approx. 70 g	

Note: 1. The values given above are initial values.

2. The upper limit of 40°C for some Relays is because of the relationship between diode junction temperature and the element used.

■ Endurance Under Real Loads (reference only)

LY1

Rated voltage	Load type	Conditions	Operating frequency	Electrical life
100 VAC	AC motor	400 W, 100 VAC single-phase with 35-A inrush current, 7-A current flow	ON for 10 s, OFF for 50 s	50,000 operations
	AC lamp	300 W, 100 VAC with 51-A inrush current, 3-A current flow	ON for 5 s, OFF for 55 s	100,000 operations
		500 W, 100 VAC with 78-A inrush current, 5-A current flow		25,000 operations
	Capacitor (2,000 μF)	24 VDC with 50-A inrush current, 1-A current flow	ON for 1 s, OFF for 6 s	100,000 operations
	AC solenoid	50 VA with 2.5-A inrush current, 0.25-A current flow	ON for 1 s, OFF for 2 s	1,500,000 operations
		100 VA with 5-A inrush current, 0.5-A current flow		800,000 operations

LY2

Rated voltage	Load type	Conditions	Operating frequency	Electrical life
100 VAC	AC motor	200 W, 100 VAC single-phase with 25-A inrush current, 5-A current flow	ON for 10 s, OFF for 50 s	200,000 operations
	AC lamp	300 W, 100 VAC with 51-A inrush current, 3-A current flow	ON for 5 s, OFF for 55 s	80,000 operations
	Capacitor (2,000 μF)	24 VDC with 50-A inrush current, 1-A current flow	ON for 1 s, OFF for 15 s	10,000 operations
		24 VDC with 20-A inrush current, 1-A current flow		150,000 operations
	AC solenoid	50 VA with 2.5-A inrush current, 0.25-A current flow	ON for 1 s, OFF for 2 s	1,000,000 operations
		100 VA with 5-A inrush current, 0.5-A current flow		500,000 operations

LY4

Rated voltage	Load type	Conditions	Operating frequency	Electrical life
100 VAC	AC motor	200 W, 200 VAC triple-phase with 5-A inrush current, 1-A current flow	ON for 10 s, OFF for 50 s	500,000 operations
		750 W, 200 VAC triple-phase with 18-A inrush current, 3.5 A current flow		70,000 operations
	AC lamp	300 W, 100 VAC with 51-A inrush current, 3-A current flow	ON for 5 s, OFF for 55 s	50,000 operations
	Capacitor (2,000 μF)	24 VDC with 50-A inrush current, 1-A current flow	ON for 1 s, OFF for 15 s	5,000 operations
		24 VDC with 20-A inrush current, 1-A current flow	ON for 1 s, OFF for 2 s	200,000 operations
	AC solenoid	50 VA with 2.5-A inrush current, 0.25-A current flow	ON for 1 s, OFF for 2 s	1,000,000 operations
		100 VA with 5-A inrush current, 0.5-A current flow		500,000 operations

Approved Standards

UL 508 Recognitions (File No. 41643)

No. of poles	Coil ratings	Contact ratings	Operations
1	6 to 240 VAC 6 to 125 VDC	15 A, 30 VDC (Resistive) 15 A, 240 VAC (General use) TV-5, 120 VAC 1/2 HP, 120 VAC	6×10^3 25×10^3
2		15 A, 28 VDC (Resistive) 15 A, 120 VAC (Resistive) 12 A, 240 VAC (General use) 1/2 HP, 120 VAC	6×10^3 25×10^3
3 and 4		10 A, 30 VDC (Resistive) 10 A, 240 VAC (General use) 1/3 HP, 240 VAC	6×10^3

CSA 22.2 No. 14 Listings (File No. LR31928)

No. of poles	Coil ratings	Contact ratings	Operations
1	6 to 240 VAC 6 to 125 VDC	15 A, 30 VDC (Resistive) 15 A, 120 VAC (General use) 1/2 HP, 120 VAC TV-5, 120 VAC	6×10^3 25×10^3
2		15 A, 30 VDC (Resistive) 15 A, 120 VAC (Resistive) 1/2 HP, 120 VAC TV-3, 120 VAC	6×10^3
3 and 4		10 A, 30 VDC (Resistive) 10 A, 240 VAC (General use)	

SEV Listings (File No. D3,31/137)

No. of poles	Coil ratings	Contact ratings	Operations
1	6 to 240 VAC 6 to 125 VDC	15 A, 24 VDC 15 A, 220 VAC	6×10^3
2 to 4		10 A, 24 VDC 10 A, 220 VAC	

TÜV (File No. R9251226) (IEC255)

No. of poles	Coil ratings	Contact ratings	Operations
1 to 4	6 to 125 VDC 6 to 240 VAC	LY1, LY1-FD 15 A, 110 VAC ($\cos\phi$=1) 10 A, 110 VAC ($\cos\phi$=0.4) LY2, LY2-FD, LY3, LY3-FD, LY4, LY4-FD 10 A, 110 VAC ($\cos\phi$=1) 7.5 A, 110 VAC ($\cos\phi$=0.4)	100×10^3

VDE Recognitions (No. 9903UG and 9947UG)

No. of poles	Coil ratings	Contact ratings	Operations
1	6, 12, 24, 50, 110, 220 VAC 6, 12, 24, 48, 110 VDC	10 A, 220 VAC ($\cos\phi$=1) 7 A, 220 VAC ($\cos\phi$=0.4) 10 A, 28 VDC (L/R=0 ms) 7 A, 28 VDC (L/R=7 ms)	200×10^3
2		7 A, 220 VAC ($\cos\phi$=1) 4 A, 220 VAC ($\cos\phi$=0.4) 7 A, 28 VDC (L/R=0 ms) 4 A, 28 VDC (L/R=7 ms)	

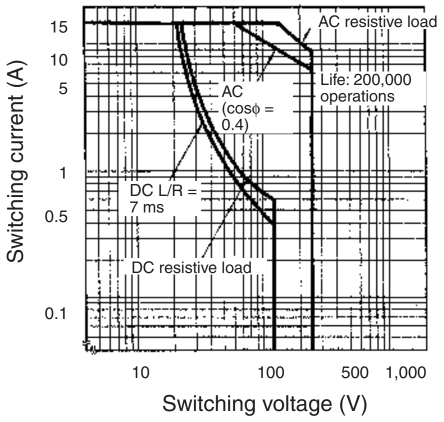
LR Recognitions (No. 563KOB-204523)

No. of poles	Coil ratings	Contact ratings
2, 4	6 to 240 VAC 6 to 110 VDC	7.5 A, 230 VAC (PF0.4) 5 A, 24 VDC (L/R=7 ms)

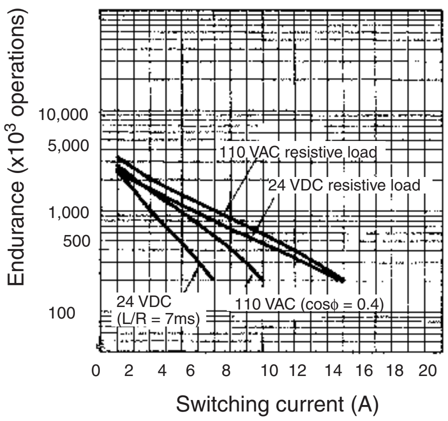
Engineering Data

LY1

Maximum Switching Power

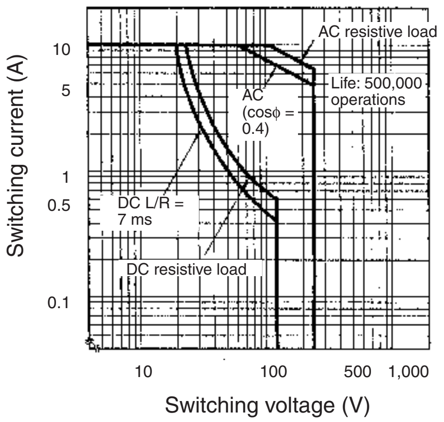


Endurance

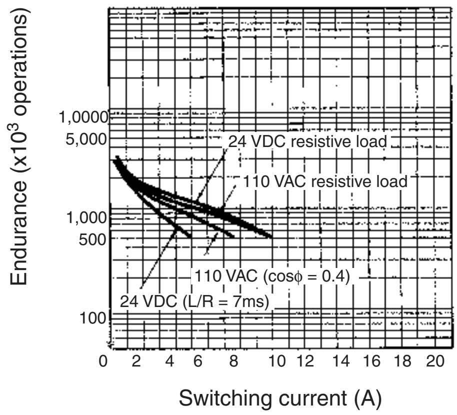


LY2

Maximum Switching Power

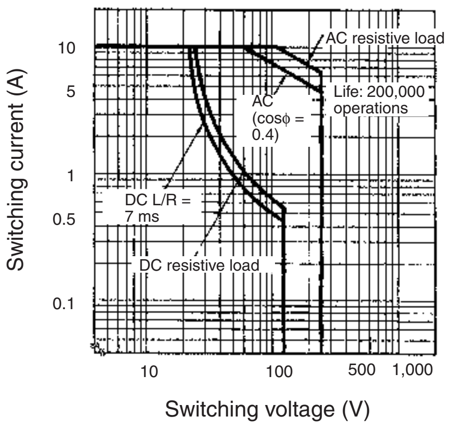


Endurance

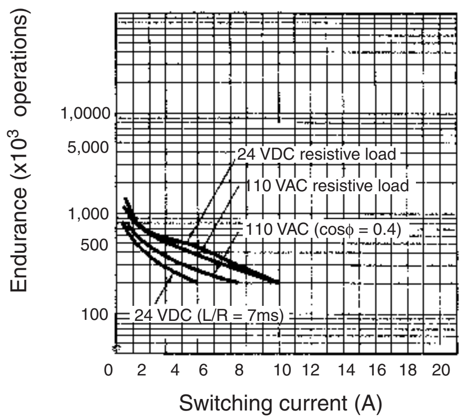


LY3 and LY4

Maximum Switching Power

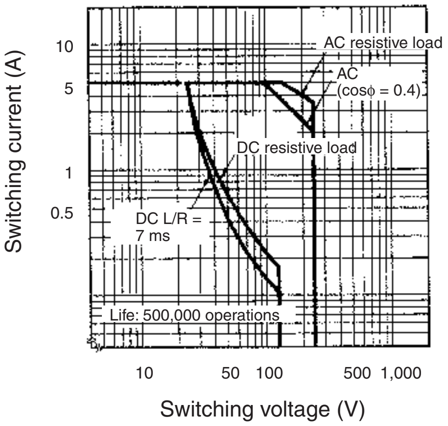


Endurance

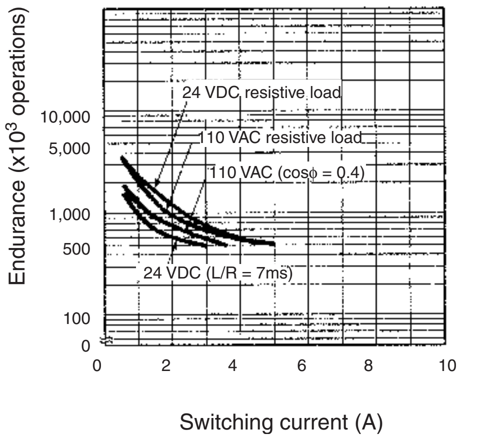


LY2Z

Maximum Switching Power



Endurance

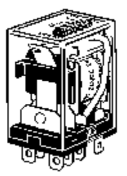


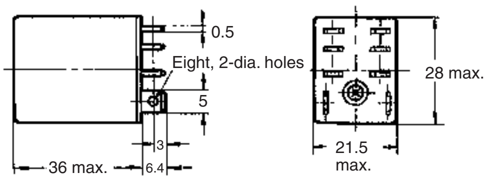
Dimensions

Note: All units are in millimeters unless otherwise indicated.

Relays with Solder/Plug-in Terminals

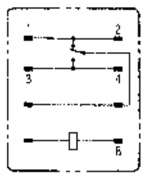
LY1
LY1N (-D2)
LY1-D



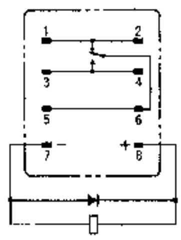


Terminal Arrangement/Internal Connections (Bottom View)

LY1

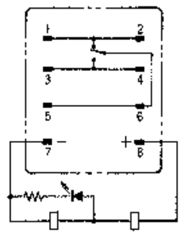


LY1-D

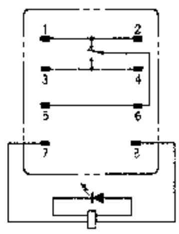


LY1N

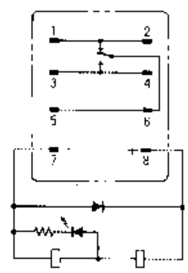
DC Model



AC Model

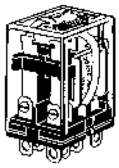


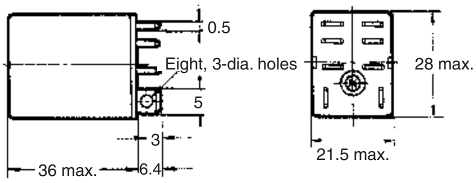
LY1N-D2



Note: The DC models have polarity.

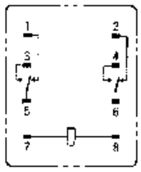
LY2 LY2-D LY2N LY2N-D2
LY2Z LY2Z-D LY2ZN LY2ZN-D2



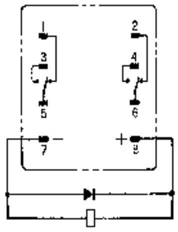


Terminal Arrangement/Internal Connections (Bottom View)

LY2(Z)

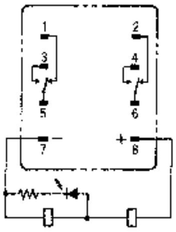


LY2(Z)-D

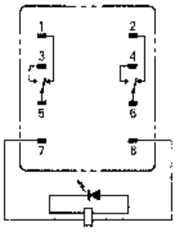


LY2(Z)N

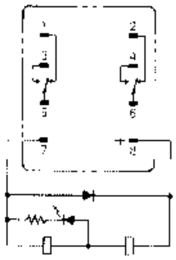
DC Model



AC Model

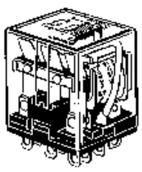


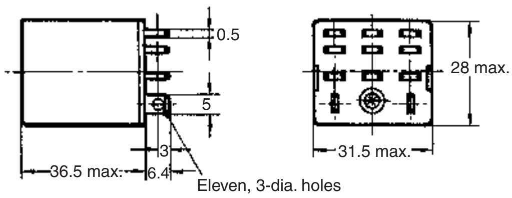
LY2(Z)N-D2



Note: The DC models have polarity.

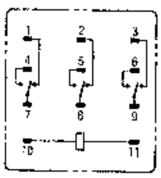
LY3Z
LY3N
LY3-D



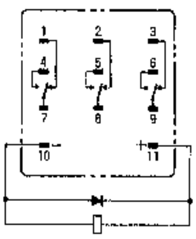


Terminal Arrangement/Internal Connections (Bottom View)

LY3

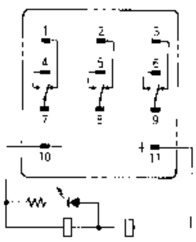


LY3-D

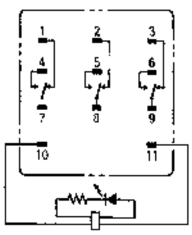


LY3N

DC Model

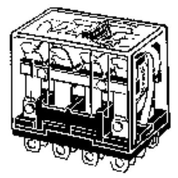


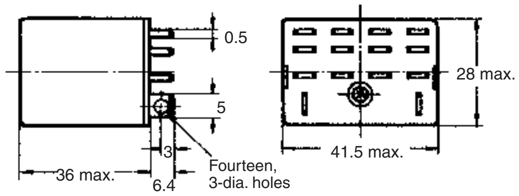
AC Model



Note: The DC models have polarity.

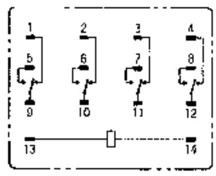
LY4 **LY4N**
LY4-D **LY4N-D2**



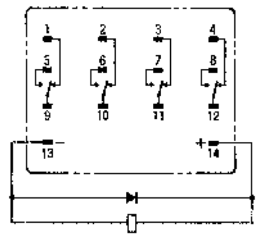


Terminal Arrangement/Internal Connections (Bottom View)

LY4

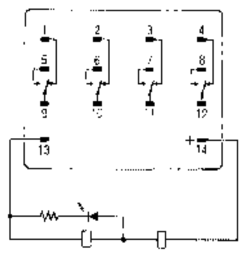


LY4-D

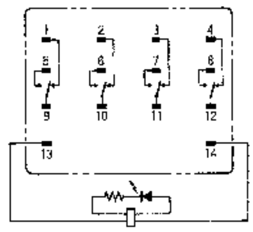


LY4N

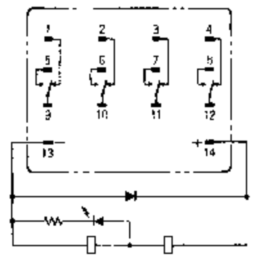
DC Model



AC Model

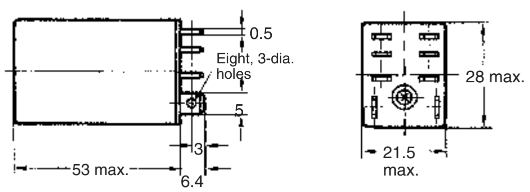


LY4N-D2



Note: The DC models have polarity.

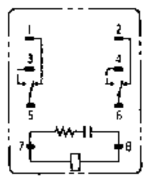
LY2-CR
LY2Z-CR
LY2N-CR
LY2ZN-CR



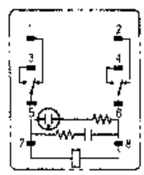
Model: LY2N-CR

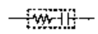
Terminal Arrangement/Internal Connections (Bottom View)

LY2(Z)-CR



LY2(Z)N-CR

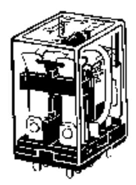


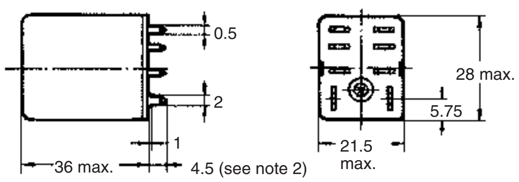


CR Element
C: 0.033 μF
R: 120 Ω

Relays with PCB Terminals

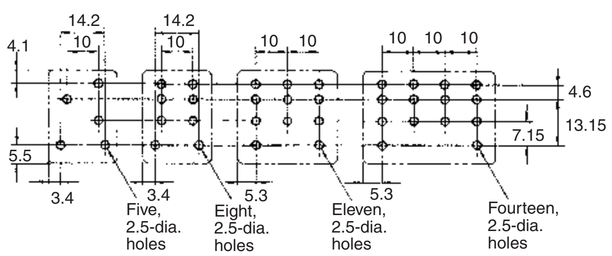
LY1-0 **LY3-0**
LY2-0 **LY4-0**





Note: 1. The above model is the LY2-0.
2. This figure is 6.4 for the LY1-0

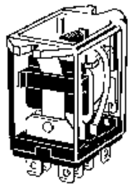
PC Board Holes (Bottom View)

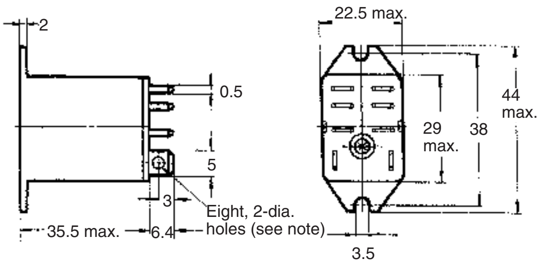


Note: 1. The tolerance for the above figures is 0.1 mm.
2. Besides the terminals, some part of the LY1-0 carries current. Due attention should be paid when mounting the LY1-0 to a double-sided PC board.

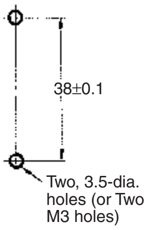
Upper-mounting Relays

LY1F
LY2F



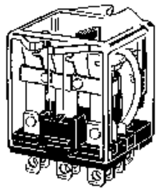


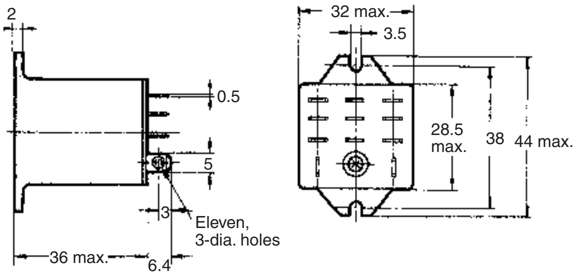
Mounting Holes

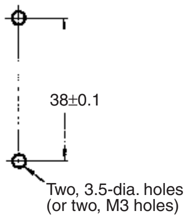


Note: 1. Eight 3-dia. holes should apply to the LY2F model.

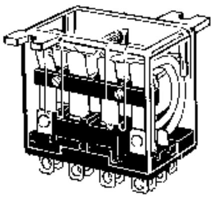
LY3F

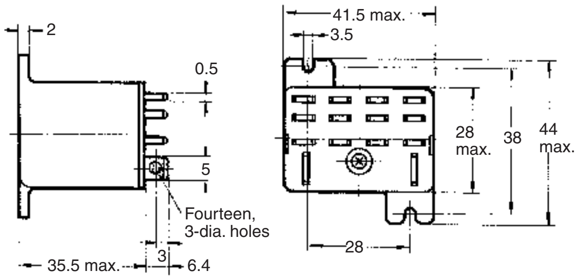




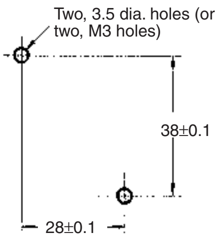


LY4F





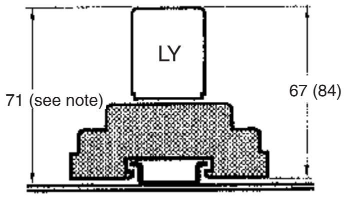
Mounting holes



Mounting Height with Socket

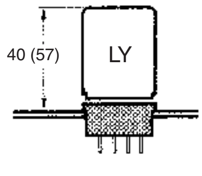
The following Socket heights should be maintained.

Front-connecting



PTF□A (-E)

Back-connecting

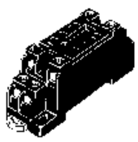


PT□

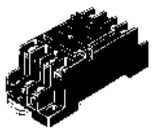
Note: 1. The PTF□A (-E) can be track-mounted or screw-mounted.
2. For the LY□-CR (CR circuit built-in type) model, this figure should be 88.

Sockets

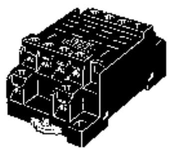
PTF08A-E



PTF11A



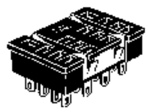
PTF14A-E



PT08

PT11

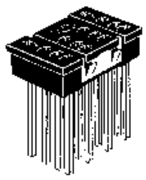
PT14



PT08QN

PT11QN

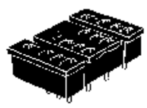
PT14QN



PT08-0

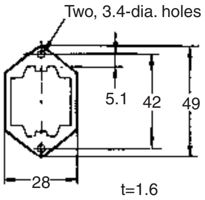
PT11-0

PT14-0

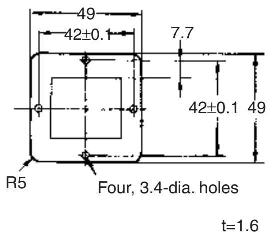


Mounting Plates for Back-connecting

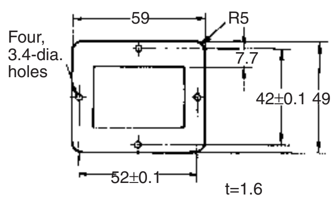
PYP-1



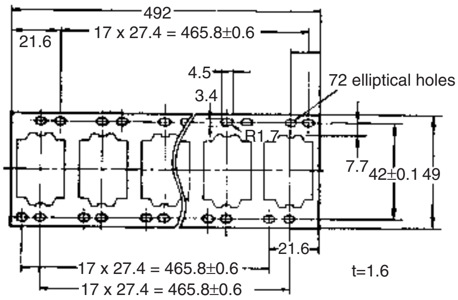
PTP-1-3



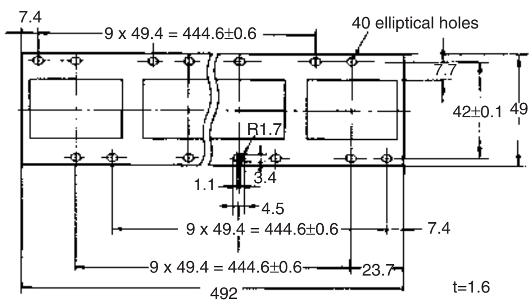
PTP-1



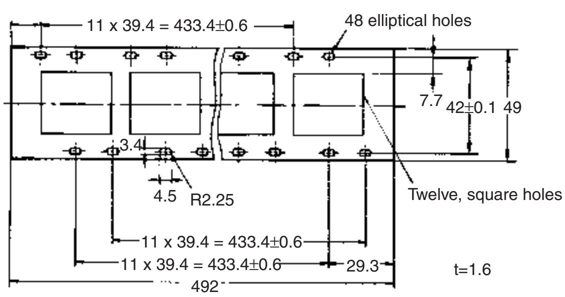
PYP-18



PTP-10

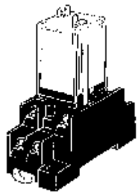
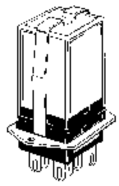
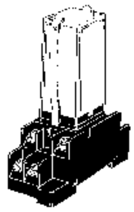


PTP-12



■ Hold-down Clips

Hold-down clips are used to hold Relays to Sockets and prevent them from coming loose due to vibration or shock.

Used with Socket		Used with Socket mounting plate	For CR circuit built-in Relay	
PYC-A1 	PYC-P 	PYC-S 	Y92H-3 	PYC-1 

Precautions

Refer to page ??? for general precautions.

■ Connections

Do not reverse polarity when connecting DC-operated Relays with built-in diodes or indicators.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

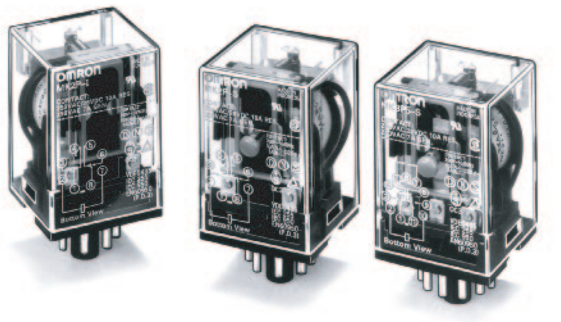
Cat. No. J002-E1-10

In the interest of product improvement, specifications are subject to change without notice.

General-purpose Relay
MK-I/-S

Exceptionally Reliable General-purpose Relay Features Mechanical Indicator/Push Button

- Breaks relatively large load currents despite small size.
- Long life (minimum 100,000 electrical operations) assured by silver contacts.
- Built-in operation indicator (Mechanical, LED), push button, diode surge suppression, varistor surge suppression.
- Standard models are UL, CSA, SEV, DEMKO, NEMKO, SEMKO, TÜV (IEC), and VDE.
- Conforming to CENELEC standards.



Model Number Structure

■ Model Number Legend

Standard Models

MK □ □ □ - □ - □ □
1 2 3 4 5 6

1. Contact Form
2: DPDT
3: 3PDT

2. Cover
P: Dust cover

3. Internal Connection Construction
Blank: Standard
2 or 5: Non-standard connection
(Refer to *Terminal Arrangement/ Internal Connections)*

4. Mechanical Indicator Push Button
S: Mechanical indicator and push button
I: Mechanical indicator

5. Approved Standards
Blank: UL, CSA, DEMKO, NEMKO SEMKO, SEV, TÜV
VD: VDE

6. Rated Voltage
(Refer to *Coil Ratings*)

Special Accessories

MK □ □ □ □ - □ - □ - □ □
1 2 3 4 5 6 7 8

1. Contact Form
2: DPDT
3: 3PDT

2. Cover
P: Dust cover

3. Classification
N: LED indicator
D: Diode
V: Varistor
ND: LED indicator and diode
NV: LED indicator and varistor

4. Coil Polarity
Blank: Standard
1: Reverse
(Refer to *Terminal Arrangement/ Internal Connections)*

5. Internal Connection Construction
Blank: Standard
2 or 5: Non-standard connection
(Refer to *Terminal Arrangement/ Internal Connections)*

6. Mechanical Indicator Push Button
S: Mechanical indicator and push button
I: Mechanical indicator

7. Approved Standards
Blank: UL and CSA only
VD: VDE (N and D models only)

8. Rated Voltage
(Refer to *Coil Ratings*)

Ordering Information

■ List of Models

Type	Terminal	Contact form	Internal connection (see note 3)	With mechanical indicator	With mechanical indicator and pushbutton	Coil ratings	Approved standards
Standard	Plug-in	DPDT	Standard	MK2P-I	MK2P-S	AC (∿), DC (⎓)	UL, CSA, SEV, DEMKO, NEM-KO, SEMKO, TÜV
			Non-standard	MK2P2-I	MK2P2-S		
		3PDT	Standard	MK3P-I	MK3P-S		
			Non-standard	MK3P2-I MK3P5-I	MK3P2-S MK3P5-S		
LED Indicator (see note 2)		DPDT	Standard	MK2PN□-I	MK2PN□-S	AC (∿), DC (⎓)	UL, CSA
			Non-standard	MK2PN□-2-I	MK2PN□-2-S		
		3PDT	Standard	MK3PN□-I	MK3PN□-S		
			Non-standard	MK3PN□-2-I MK3PN□-5-I	MK3PN□-2-S MK3PN□-5-S		
Diode (see note 2)		DPDT	Standard	MK2PD□-I	MK2PD□-S	DC (⎓)	UL, CSA
			Non-standard	MK2PD□-2-I	MK2PD□-2-S		
		3PDT	Standard	MK3PD□-I	MK3PD□-S		
			Non-standard	MK3PD□-2-I MK3PD□-5-I	MK3PD□-2-S MK3PD□-5-S		
Varistor		DPDT	Standard	MK2PV-I	MK2PV-S	AC (∿)	UL, CSA
			Non-standard	MK2PV-2-I	MK2PV-2-S		
		3PDT	Standard	MK3PV-I	MK3PV-S		
			Non-standard	MK3PV-2-I MK3PV-5-I	MK3PV-2-S MK3PV-5-S		
VDE approved		DPDT	Standard	MK2P-I-VD	MK2P-S-VD	AC (∿), DC (⎓)	UL, CSA, SEV, DEMKO, NEM-KO, SEMKO, TÜV, VDE
			Non-standard	MK2P2-I-VD	MK2P2-S-VD		
		3PDT	Standard	MK3P-I-VD	MK3P-S-VD		
			Non-standard	MK3P2-I-VD MK3P5-I-VD	MK3P2-S-VD MK3P5-S-VD		
LED Indicator VDE approved		DPDT	Standard	MK2PN-I-VD	MK2PN-S-VD	AC (∿), DC (...)	UL, CSA, VDE
			Non-standard	MK2PN-2-I-VD	MK2PN-2-S-VD		
		3PDT	Standard	MK3PN-I-VD	MK3PN-S-VD		
			Non-standard	MK3PN-2-I-VD	MK3PN-2-S-VD		
				MK3PN-5-I-VD	MK3PN-5-S-VD		
Diode VDE approved		DPDT	Standard	MK2PD-I-VD	MK2PD-S-VD	DC (...)	UL, CSA, VDE
			Non-standard	MK2PD-2-I-VD	MK2PD-2-S-VD		
		3PDT	Standard	MK3PD-I-VD	MK3PD-S-VD		
			Non-standard	MK3PD-2-I-VD	MK3PD-2-S-VD		
				MK3PD-5-I-VD	MK3PD-5-S-VD		

Note: **1.** When ordering, add the rated voltage to the model number. Rated voltages are given in the coil ratings table in *Specifications*.

Example: MK3P5-S 230 VAC
Rated voltage

2. This DC coil comes in two types: standard coil polarity and reversed coil polarity. Refer to *Terminal Arrangement/Internal Connections.*

Example: MK2PN1-I 24 VDC
Reverse polarity

3. Refer to *Terminal Arrangement/Internal Connections* for non-standard internal connection.

4. The gold plating thickness depends on the request.

Example: MK3P-I AP3 24 VAC
Gold plating thickness: 3 µm

■ Accessories (Order Separately)

Item		Model
Track-mounted Socket	8-pin type	PF083A-E
	11-pin type	PF113A-E
Hold-down Clip		PFC-A1

Specifications

■ Coil Ratings

UL, CSA, DEMKO, NEMKO, SEMKO, SEV, TÜV

Rated voltage		Rated current		Coil resistance	Must operate voltage	Must release voltage	Max. voltage	Power consumption
		60 Hz	50 Hz					
AC (∿)	6 V	360 mA	404 mA	3.9 Ω	80% max. of rated voltage	30% min. of rated voltage	90% to110% of rated voltage	Approx. 2.3 VA (at 60 Hz) Approx. 2.7 VA (at 50 Hz)
	12 V	180 mA	202 mA	16.9 Ω				
	24 V	88.0 mA	98.0 mA	62.0 Ω				
	50 V	39.0 mA	46.3 mA	330 Ω				
	100 V	24.8 mA	28.4 mA	1,010 Ω				
	110 V	21.0 mA	24.7 mA	1,240 Ω				
	120 V	18.0 mA	20.2 mA	1,520 Ω				
	200 V	12.1 mA	14.2 mA	4,520 Ω				
	220 V	11.0 mA	12.9 mA	5,130 Ω				
	230 V	10.5 mA	12.3 mA	6,170 Ω				
	240 V	9.2 mA	10.3 mA	6,450 Ω				
DC (⎓)	6 V	255 mA		23.5 Ω		15% min. of rated voltage		Approx. 1.5 W
	12 V	126 mA		95 Ω				
	24 V	56 mA		430 Ω				
	48 V	29.5 mA		1,630 Ω				
	100 V	14.7 mA		6,800 Ω				
	110 V	15.1 mA		7,300 Ω				

VDE

Rated voltage		Rated current		Coil resistance	Must operate voltage	Must release voltage	Max. voltage	Power consumption
		50 Hz	60 Hz					
AC (∿)	6 V	380 mA	325 mA	4.4 Ω	80% max. of rated voltage	30% min. of rated voltage	90% to110% of rated voltage	Approx. 2.0 VA (at 60 Hz) Approx. 2.4 VA (at 50 Hz)
	12 V	175 mA	145 mA	19.0 Ω				
	24 V	91.0 mA	76.5 mA	70.7 Ω				
	50 V	42.0 mA	36.0 mA	330 Ω				
	100 V	24.0 mA	20.5 mA	1,150 Ω				
	110 V	21.5 mA	18.0 mA	1,400 Ω				
	120 V	20.0 mA	17.0 mA	1,600 Ω				
	200 V	11.2 mA	9.4 mA	5,110 Ω				
	220 V	10.2 mA	8.7 mA	5,800 Ω				
	230 V	9.6 mA	8.1 mA	6,990 Ω				
	240 V	9.4 mA	7.9 mA	7,400 Ω				
DC (⎓)	6 V	225 mA		26.7 Ω		15% min. of rated voltage		Approx. 1.3 W
	12 V	116 mA		107 Ω				
	24 V	56.0 mA		440 Ω				
	48 V	29.0 mA		1,660 Ω				
	100 V	13.1 mA		7,660 Ω				
	110 V	12.5 mA		8,720 Ω				

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with tolerances of +15%/–20% for AC rated current and ±15% for DC coil resistance.
2. Performance characteristic data are measured at a coil temperature of 23°C.
3. ∿ indicates AC and ⎓ indicates DC (IEC417 publications).
4. For 200 VDC applications, a 100-VDC Relay is supplied with a fixed 6.8 kΩ, 30 W resistor. Be sure to connect the resistor in series with the coil.
5. For models with the LED indicator built in, add an LED current of approximately 0 through 5 mA to the rated current.

■ Contact Ratings

Load	Resistive load (cosϕ = 1)	Inductive load (cosϕ = 0.4)
Contact mechanism	Single	
Contact material	Ag	
Rated load	10 A at 250 VAC 10A at 28 VDC	7 A at 250 VAC
Rated carry current	10 A	
Max. switching voltage	250 VAC, 250 VDC	
Max. switching current	10 A	
Max. switching power	2,500 VA, 280 W	1,750 VA

■ Characteristics

Contact resistance	50 mΩ max.
Operate time	AC: 20 ms max. DC: 30 ms max.
Release time	20 ms max.
Max. operating frequency	Mechanical:18,000 operations/hr Electrical:1,800 operations/hr (under rated load)
Insulation resistance	100 MΩ min. (at 500 VDC)
Dielectric strength	2,500 VAC, 50/60 Hz for 1 min between coil and contacts; 1,000 VAC, 50/60 Hz for 1 min between contacts of same polarity, terminals of the same polarity; 2,500 VAC, 50/60 Hz fro 1 min between current-carrying parts, non-current-carrying parts, and terminals of opposite polarity
Vibration resistance	Destruction:10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude) Malfunction:10 to 55 to 10 Hz, 0.5-mm single amplitude (1.0-mm double amplitude)
Shock resistance	Destruction:1,000 m/s^2 (approx. 100G) Malfunction:100 m/s^2 (approx. 10G);
Endurance	Mechanical:10,000,000 operations min. (at operating frequency of 18,000 operations/hour) Electrical:Refer to *Engineering Data*.
Error rate (reference value)	10 mA at 1 VDC
Ambient temperature	Operating:–10°C to 40°C (with no icing or condensation)
Ambient humidity	Operating: 5% to 85%
Weight	Approx. 85 g

Note: The data shown are initial values.

■ Approved Standards

The following ratings apply to all models.

UL 508 (File No. E41515)/CSA 22.2 No.0/14 (File No. LR35535)

Coil ratings	Contact ratings	Operations
6 to 110 VDC 6 to 240 VAC	10 A, 28 VDC (resistive) 10 A, 250 VAC (resistive) 7 A, 250 VAC (general use)	100,000 cycles

SEV, DEMKO, NEMKO

Coil ratings	Contact ratings	Operations
6 to 110 V⎓ 6 to 240 V∿	10 A, 250 V∿ (NO) (cosϕ = 1) 5 A, 250 V∿ (NC) (cosϕ = 1) 10 A, 28 V⎓ (NO) 5 A, 28 V⎓ (NC) 7 A, 250 V∿ (cosϕ = 0.4)	100,000 cycles

SEMKO

Coil ratings	Contact ratings	Operations
6 to 110 V⎓ 6 to 240 V∿	10 A, 250 V∿ (NO) (cosϕ = 1) 5 A, 250 V∿ (NC) (cosϕ = 1)	100,000 cycles

TÜV (VDE 0435 Teil 201/05’90, IEC 255 Teil 1-00/’75, EN 60950/’88

(TÜV File No.: R9051410)

Coil ratings	Contact ratings	Conditions	Operations
6, 12, 24, 48, 100 110 V⎓ 6, 12, 24, 50, 100, 110 115, 120, 200, 220 230, 240 V∿	10 A, 250 V∿ (cosϕ = 1) 10 A, 28 V⎓ 7 A, 250 V∿ (cosϕ = 0.4)	IEC 255-1-00 Item 3.1.4 Pollution Degree 3, Overvoltage Category II Pick up class - class 2 Temperature class - class b	100,000 cycles

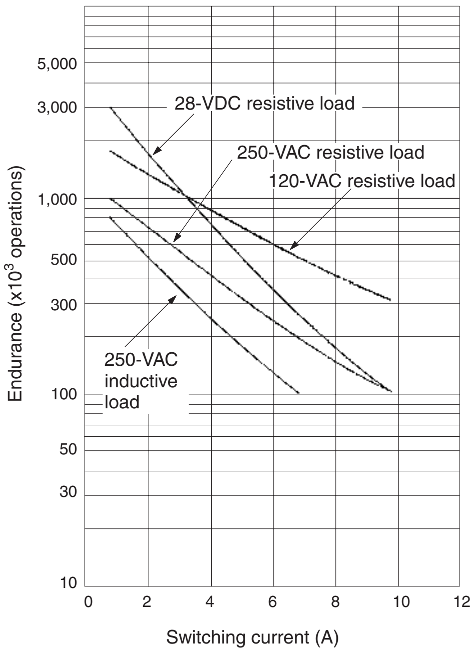
VDE (VDE 0435 Teil 201/05’83, IEC 255 Teil 1-00/’75)

(VDE File No.: NR 5340)

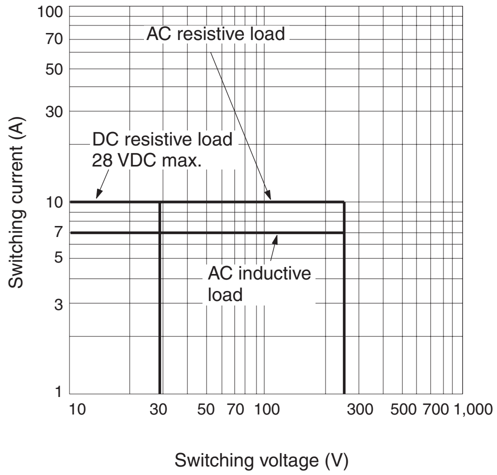
Coil ratings	Contact ratings	Conditions	Operations
6, 12, 24, 48, 100 110 V⎓ 6, 12, 24, 50, 100, 110 115, 120, 200, 220 230, 240 V∿	10 A, 250 V∿ (cosϕ = 1) 10 A, 28 V⎓ 7 A, 250 V∿ (cosϕ ⎓ 0.4)	C/250 - class 1, class C	100,000 cycles

Engineering Data

■ Electrical Endurance



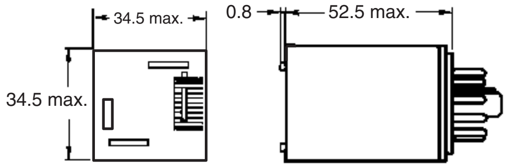
■ Maximum Switching Power



Dimensions

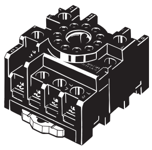
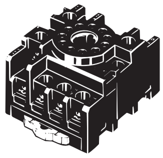
Note: All units are in millimeters unless otherwise indicated.

■ Relays



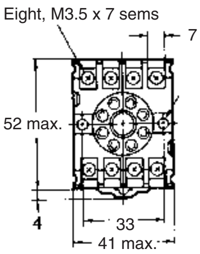
Sockets

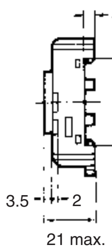
See below for Socket dimensions.

Socket	Surface-mounting Socket (for track or screw mounting)	
	Finger-protection models	**---**
Maximum carry current	10 A	5 A
2 poles	PF083A-E	PF083A
3 poles	PF113A-E 	PF113A 

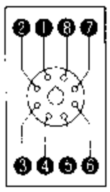
Note: Use the Surface-mounting Sockets (i.e., finger-protection models) with "-E" at the end of the model number. When using the PF083A and PF113A, be sure not to exceed the Socket's maximum carry current of 5 A. Using at a current exceeding 5 A may lead to burning. Round terminals cannot be used for finger-protection models. Use Y-shaped terminals.

PF083A-E (Conforming to EN 50022)

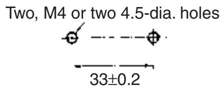




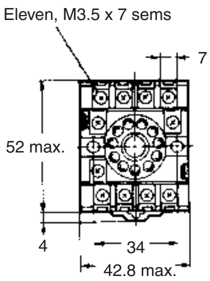
Terminal Arrangement

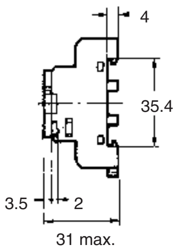


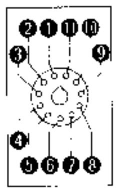
Mounting Holes

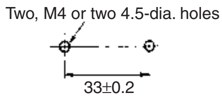


PF113A-E (Conforming to EN 50022)



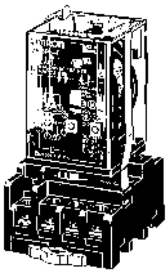






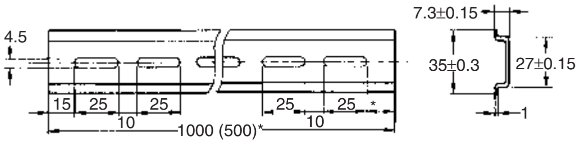
Hold-down Clips

PFC-A1



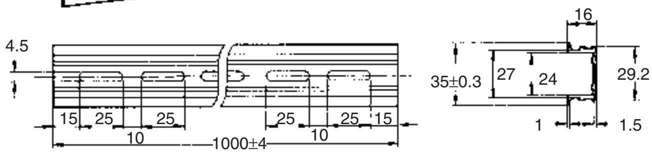
Mounting Tracks

PFP-100N, PFP-50N (Conforming to EN 50022)



* This dimension applies to the PFP-50N Mounting Track.

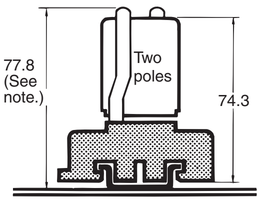
PFP-100N2 (Conforming to EN 50022)



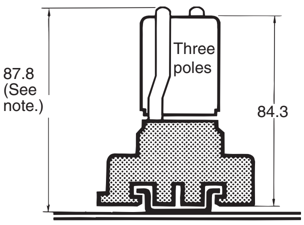
* A total of twelve 25 x 4.5 elliptic holes is provided with six holes cut from each track end at a pitch of 10 mm.

Mounting Height with Sockets

Surface-mounting Sockets



PF083A(-E)



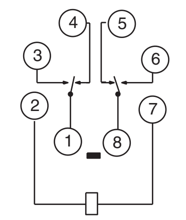
PF113A(-E)

Note: PF083A(-E) and PF113A(-E) allow either track or screw mounting.

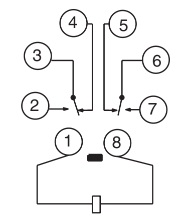
Terminal Arrangement/Internal Connection (Bottom View)

Standard (AC/DC Coil)

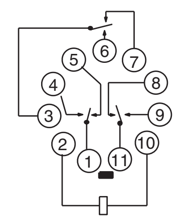
MK2P-I, -S



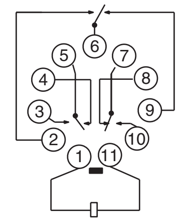
MK2P2-I, -S



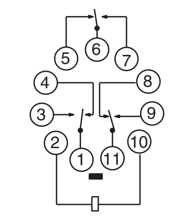
MK3P-I, -S



MK3P2-I, -S

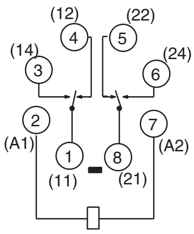


MK3P5-I, -S

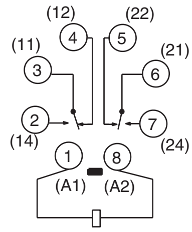


VDE-approved Type (AC/DC Coil)
( ): Dual Numbering

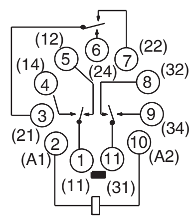
MK2P-I-VD, -S-VD



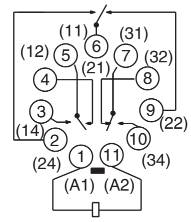
MK2P2-I-VD, -S-VD



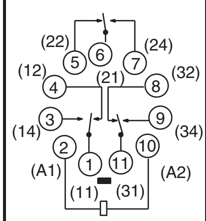
MK3P-I-VD, -S-VD



MK3P2-I-VD, -S-VD

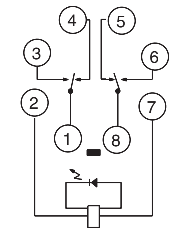


MK3P5-I-VD, -S-VD

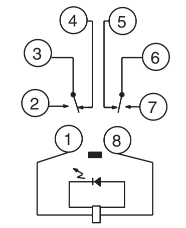


LED Indicator Type (AC Coil)

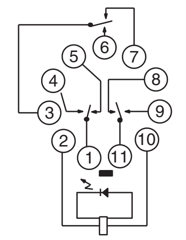
MK2PN-I, -S



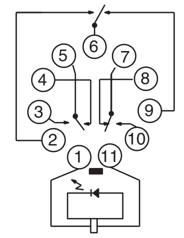
MK2PN-2-I, -S



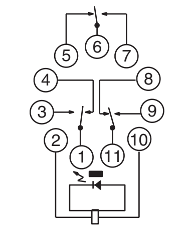
MK3PN-I, -S



MK3PN-2-I, -S



MK3PN-5-I, -S



LED Indicator Type (DC Coil: Standard Polarity)

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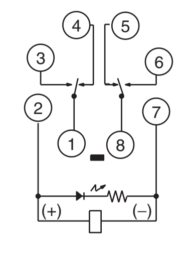
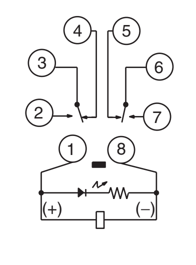
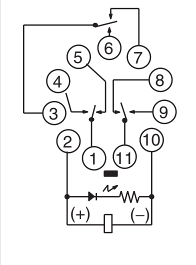
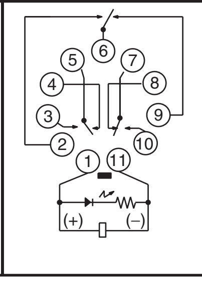
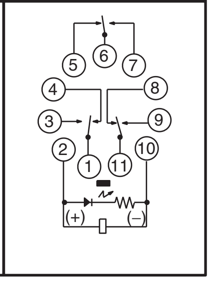
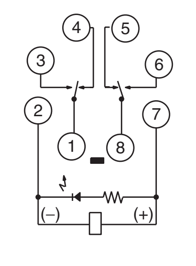
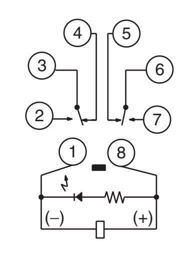
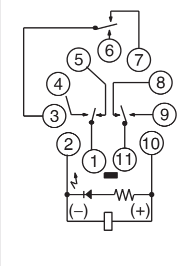
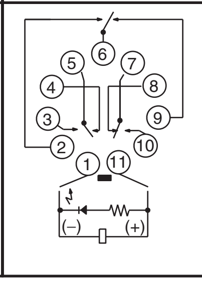
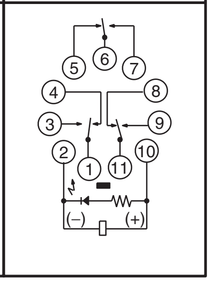
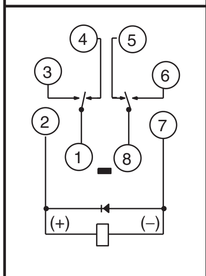
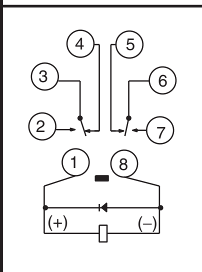
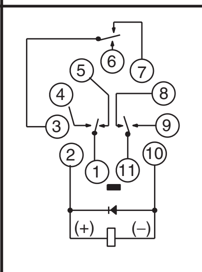
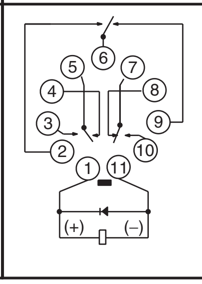
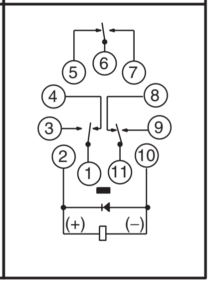
				

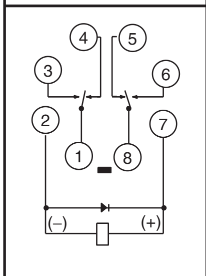
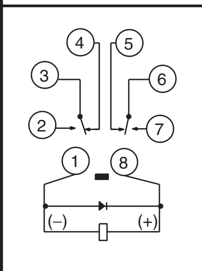
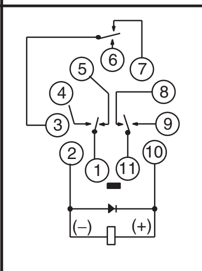
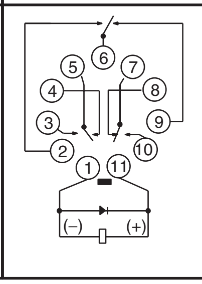
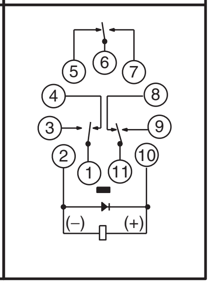
LED Indicator Type (DC Coil: Reverse Polarity)

MK2PN1-I, -S	MK2PN1-2-I, -S	MK3PN1-I, -S	MK3PN1-2-I, -S	MK3PN1-5-I, -S
				

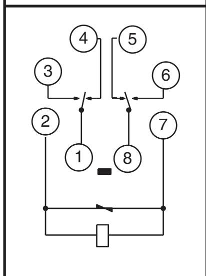
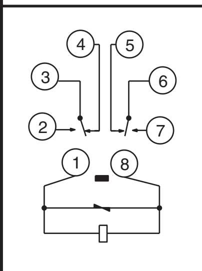
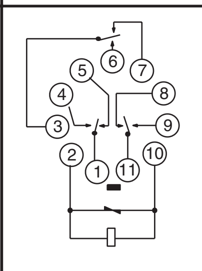
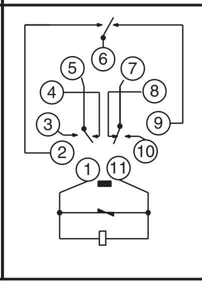
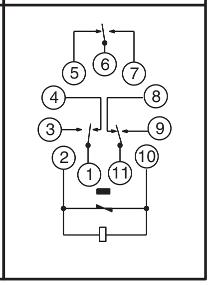
Diode Type (DC Coil: Standard Polarity)

MK2PD-I, -S	MK2PD-2-I, -S	MK3PD-I, -S	MK3PD-2-I, -S	MK3PD-5-I, -S
				

Diode Type (DC Coil: Reverse Polarity)

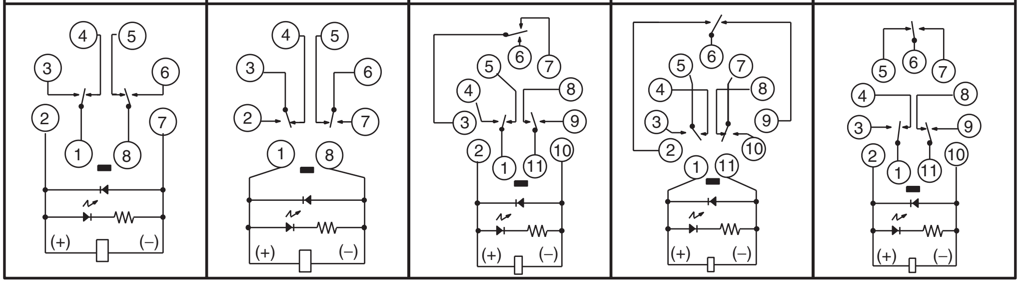
MK2PD1-I, -S	MK2PD1-2-I, -S	MK3PD1-I, -S	MK3PD1-2-I, -S	MK3PD1-5-I, -S
				

Varistor Type (AC Coil)

MK2PV-I, -S	MK2PV-2-I, -S	MK3PV-I, -S	MK3PV-2-I, -S	MK3PV-5-I, -S
				

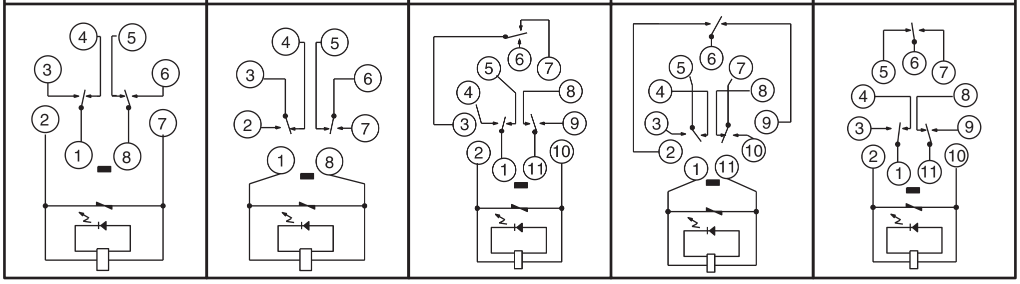
LED Indicator and Diode Type (DC Coil)

MK2PND-I, -S	MK2PND-2-I, -S	MK3PND-I, -S	MK3PND-2-I, -S	MK3PND-5-I, -S



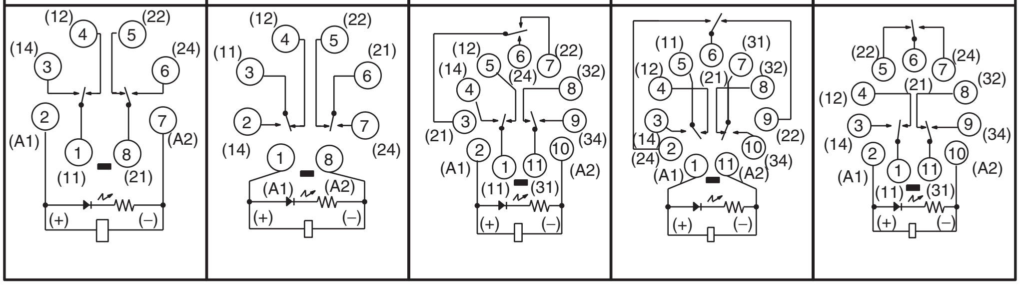
LED Indicator and Varistor Type (AC Coil)

MK2PNV-I, -S	MK2PNV-2-I, -S	MK3PNV-I, -S	MK3PNV-2-I, -S	MK3PNV-5-I, -S



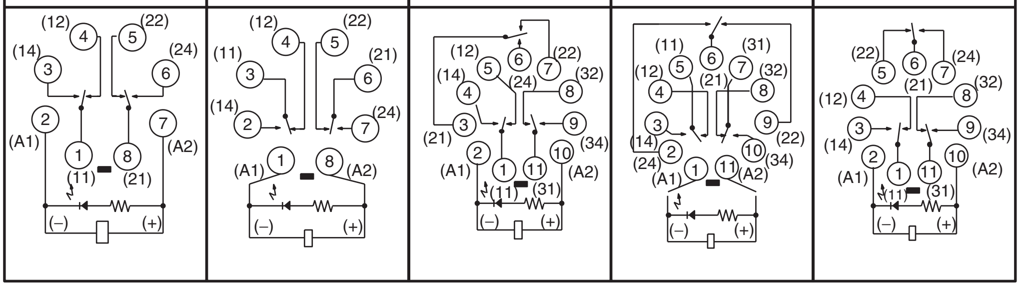
VDE Approved Type LED Indicator Type (DC Coil: Standard Polarity) ( ): Dual Numbering

MK2PN-I-VD, -3-VD	MK2PN-2-I-VD, -3-VD	MK3PN-I-VD, -S-VD	MK3PN-2-I-VD, -S-VD	MK3PN-5-I-VD, -S-VD



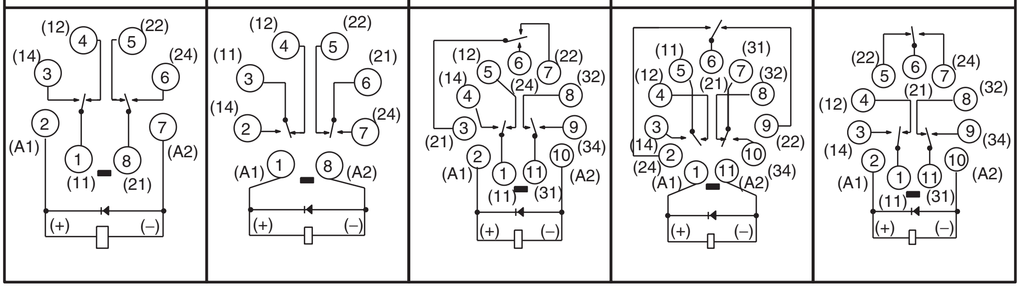
VDE Approved Type LED Indicator Type (DC Coil: Reverse Polarity)

MK2PN1-I-VD, -S-VD	MK2PN1-2-I-VD, -S-VD	MK3PN1-I-VD, -S-VD	MK3PN1-2-I-VD, -S-VD	MK3PN1-5-I-VD, -S-VD

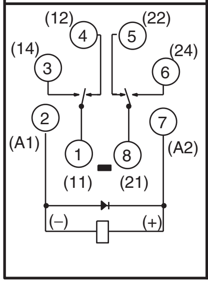
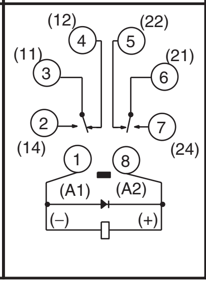
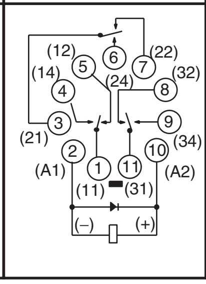
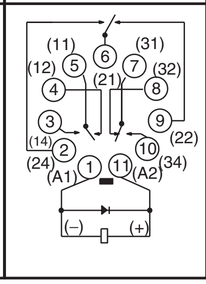
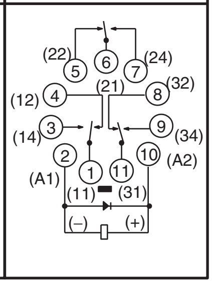


VDE Approved Type Diode Type (DC Coil: Standard Polarity)

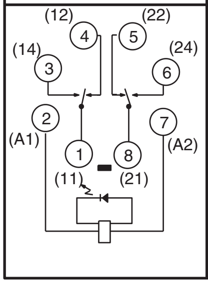
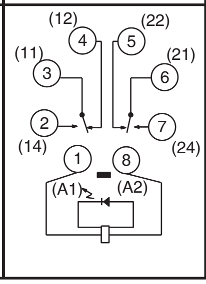
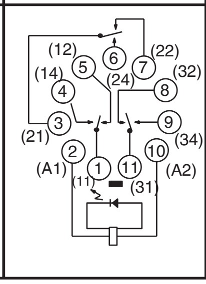
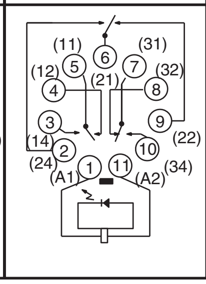
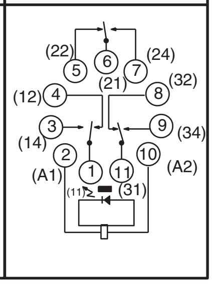
MK2PD-I-VD, -S-VD	MK2PD-2-I-VD, -S-VD	MK3PD-I-VD, -S-VD	MK3PD-2-I-VD, -S-VD	MK3PD-5-I-VD, -S-VDS



VDE Approved Type
Diode Type
(DC Coil:
Reverse Polarity)

MK2PD1-I-VD, -S-VD	MK2PD1-2-I-VD, -S-VD	MK3PD1-I-VD, -S-VD	MK3PD1-2-I-VD, -S-VD	MK3PD1-5-I-VD, -S-VD
				

VDE Approved Type
LED Indicator Type
(AC Coil)

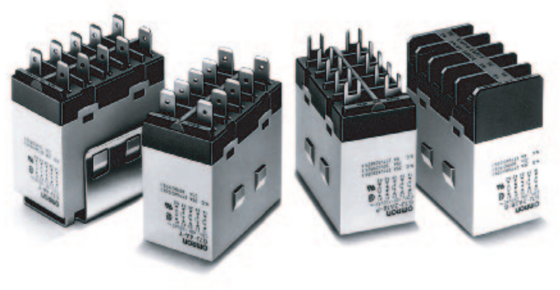
MK2PN-I-VD, -S-VD	MK2PN-2-I-VD, -S-VD	MK3PN-I-VD, -S-VD	MK3PN-2-I-VD, -S-VD	MK3PN-5-I-VD, -S-VD
				

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Power Relay
G7J

A High-capacity, High-dielectric-strength, Multi-pole Relay Used Like a Contactor

- Miniature hinge for maximum switching power for motor loads as well as resistive and inductive loads.
- No contact chattering for momentary voltage drops up to 50% of rated voltage.
- Withstanding more than 4 kV between contacts that are different in polarity and between the coil and contacts.
- Flame-resistant materials (UL94V-0-qualifying) used for all insulation material.
- Standard models approved by UL and CSA.



Model Number Structure

■ Model Number Legend

G7J - □ - □ - □
1 2 3

1. Contact Form
4A: 4PST-NO
3A1B: 3PST-NO/SPST-NC
2A2B: DPST-NO/DPST-NC

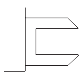
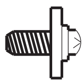
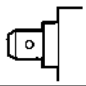
2. Terminal Shape
P: PCB terminals
B: Screw terminals
T: Quick-connect terminals (#250 terminal)

3. Contact Structure
Z: Bifurcated contact
None: Single contact

Note: For bifurcated contact type, output is 1NO (4PST-NO) or 1NC (3PST-NO/SPST-NC).

Ordering Information

■ List of Models

Mounting type	Contact form	PCB terminals 	Screw terminals 	Quick-connect terminals 
PCB mounting	4PST-NO	G7J-4A-P, G7J-4A-PZ	---	---
	3PST-NO/SPST-NC	G7J-3A1B-P, G7J-3A1B-PZ	---	---
	DPST-NO/DPST-NC	G7J-2A2B-P	---	---
W-bracket (see note)	4PST-NO	---	G7J-4A-B, G7J-4A-BZ	G7J-4A-T, G7J-4A-TZ
	3PST-NO/SPST-NC	---	G7J-3A1B-B, G7J-3A1B-BZ	G7J-3A1B-T, G7J-3A1B-TZ
	DPST-NO/DPST-NC	---	G7J-2A2B-B	G7J-2A2B-T

Note: These Relays need a W-bracket (sold separately) for mounting.
When ordering specify the voltage.
Example: G7J-4A-P 240 VAC
Rated coil voltage

PCB Terminals

Contact form	Rated voltage (V)	Model
4PST-NO	24, 50, 100 to 120, 200 to 240 VAC	G7J-4A-P
	12, 24, 48, 100 VDC	
3PST-NO/ SPST-NC	24, 50, 100 to 120, 200 to 240 VAC	G7J-3A1B-P
	12, 24, 48, 100 VDC	
DPST-NO/DPST-NC	24, 50, 100 to 120, 200 to 240 VAC	G7J-2A2B-P
	12, 24, 48, 100 VDC	

PCB Terminals (Bifurcated Contact)

Contact form	Rated voltage (V)	Model
4PST-NO	200 to 240 VAC 24 VDC	G7J-4A-PZ
3PST-NO/ SPST-NC	12, 24 VDC	G7J-3A1B-PZ

W-bracket Screw Terminals

Contact form	Rated voltage (V)	Model
4PST-NO	24, 50, 100 to 120, 200 to 240 VAC	G7J-4A-B
	12, 24, 48, 100 VDC	
3PST-NO/ SPST-NC	24, 50, 100 to 120, 200 to 240 VAC	G7J-3A1B-B
	12, 24, 48, 100 VDC	
DPST-NO/ DPST-NC	24, 50, 100 to 120, 200 to 240 VAC	G7J-2A2B-B
	12, 24, 48, 100 VDC	

■ Accessories (Order Separately)

Name	Model	Applicable Relay
W-bracket	R99-04 for G5F	G7J-4A-B G7J-3A1B-B G7J-2A2B-B G7J-4A-T G7J-3A1B-T G7J-2A2B-T

Screw Terminals (Bifurcated Contact)

Contact form	Rated voltage (V)	Model
3PST-NO/ SPST-NC	200 to 240 VAC	G7J-3A1B-BZ
	6, 12, 24, 48, 100 VDC	

Tab Terminals

Contact form	Rated voltage (V)	Model
4PST-NO	24, 50, 100 to 120, 200 to 240 VAC	G7J-4A-T
	12, 24, 48, 100 VDC	
3PST-NO/ SPST-NC	24, 50, 100 to 120, 200 to 240 VAC	G7J-3A1B-T
	12, 24, 48, 100 VDC	
DPST-NO/ DPST-NC	24, 50, 100 to 120, 200 to 240 VAC	G7J-2A2B-T
	12, 24, 48, 100 VDC	

Tab Terminals (Bifurcated Contact)

Contact form	Rated voltage (V)	Model
4PST-NO	200 to 240 VAC	G7J-4A-TZ

Consult your OMRON representative for details on models not mentioned in this document.

Application Examples

- Compressors for air conditioners and heater switching controllers.
- Switching controllers for power tools or motors.
- Lamp controls, motor drivers, and power supply switching controllers in copy machines, facsimile machines, and other office equipment.
- Power controllers for packers or food processing equipment.
- Power controllers for inverters.

Specifications

■ Coil Ratings

Rated voltage		Rated current	Coil resistance	Must-operate voltage	Must-release voltage	Max. voltage	Power consumption
AC	**24 VAC**	75 mA	---	75% max. of rated voltage	15% min. of rated voltage	110% of rated voltage	Approx. 1.8 to 2.6 VA
	50 VAC	36 mA	---				
	100 to 120 VAC	18 to 21.6 mA	---				
	200 to 240 VAC	9 to 10.8 mA	---				
DC	**6 VDC**	333 mA	18 Ω		10% min. of rated voltage		Approx. 2.0 W
	12 VDC	167 mA	72 Ω				
	24 VDC	83 mA	288 Ω				
	48 VDC	42 mA	1,150 Ω				
	100 VDC	20 mA	5,000 Ω				

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with tolerances of +15%/–20% for AC rated current and ±15% for DC coil resistance. (The values given for AC rated current apply at 50 Hz or 60 Hz.)

2. Performance characteristic data are measured at a coil temperature of 23°C.

3. The maximum voltage is one that is applicable to the Relay coil at 23°C.

■ Contact Ratings

Item	Resistive load (cos ϕ = 1)	Inductive load (cosϕ = 0.4)	Resistive load
Contact mechanism	Double break		
Contact material	Ag alloy		
Rated load	NO: 25 A at 220 VAC (24 A at 230 VAC) NC: 8 A at 220 VAC (7.5 A at 230 VAC)		NO: 25 A at 30 VDC NC: 8 A at 30 VDC
Rated carry current	NO: 25 A (1 A) NC: 8 A (1 A)		
Max. switching voltage	250 VAC		125 VDC
Max. switching current	NO: 25 A (1 A) NC: 8 A (1 A)		

Note: The values in parentheses indicate values for a bifurcated contact.

■ Characteristics

Contact resistance (see note 2)	50 mΩ max.
Operate time (see note 3)	50 ms max.
Release time (see note 3)	50 ms max.
Max. operating frequency	Mechanical: 1,800 operations/hr Electrical: 1,800 operations/hr
Insulation resistance (see note 4)	1,000 MΩ min. (at 500 VDC)
Dielectric strength	4,000 VAC, 50/60 Hz for 1 min between coil and contacts 4,000 VAC, 50/60 Hz for 1 min between contacts of different polarity 2,000 VAC, 50/60 Hz for 1 min between contacts of same polarity
Impulse withstand voltage	10,000 V between coil and contact (with 1.2 x 50 µs impulse wave)
Vibration resistance	Destruction: 10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude) Malfunction: NO:10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude) NC:10 to 26 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude)
Shock resistance	Destruction: 1,000 m/s^2 Malfunction: NO:100 m/s^2 NC:20 m/s^2
Endurance	Mechanical: 1,000,000 operations min. (at 1,800 operations/hr) Electrical: 100,000 operations min. (at 1,800 operations/hr) (see note 5)
Error rate (see note 6)	100 mA at 24 VDC (bifurcated contact: 24 VDC 10 mA)
Ambient temperature	Operating: –25°C to 60°C (with no icing or condensation)
Ambient humidity	Operating: 5% to 85%
Weight	PCB terminal: approx. 140 g Screw terminal: approx. 165 g Quick-connect terminal: approx. 140 g

Note: 1. The above values are all initial values.
2. The contact resistance was measured with 1 A at 5 VDC using the voltage drop method.
3. The operate and the release times were measured with the rated voltage imposed with any contact bounce ignored at an ambient temperature of 23°C.
4. The insulation resistance was measured with a 500-VDC megger applied to the same places as those used for checking the dielectric strength.
5. The electrical endurance was measured at an ambient temperature of 23°C.
6. This value was measured at a switching frequency of 60 operations per minute.

■ Approved Standards

The G7J satisfies the following international standards. Approval for some international markings and symbols are still pending, however, and information on them will be added when they are approved.

UL (File No. E41643)
CSA (File No. LR35535)

Coil ratings	Contact ratings		Number of test operations
24 to 265 VAC 6 to 110 VDC	NO contact	25 A 277 VAC, Resistive	30,000
		25 A 120 VAC, General Use	
		25 A 277 VAC, General Use	
		25 A 240 VAC, General Use	100,000
		1.5 kW 120 VAC, Tungsten	6,000
		1.5 hp 120 VAC	
		3 hp 240/265/277 VAC	
		3-phase 3 hp 240/265/277 VAC	30,000
		3-phase 5 hp 240/265/277 VAC	
		20FLA/120LRA 120 VAC	
		17FLA/102LRA 277 VAC	
		TV-10 120 VAC	25,000
		25 A 30 VDC, Resistive	30,000
		*1 A 277 VAC, General Use	6,000
	NC contact	8 A 277 VAC, Resistive	30,000
		8 A 120 VAC, General Use	
		8 A 277 VAC, General Use	
		8 A 30 VDC, Resistive	
		*1 A 277 VAC, General Use	6,000

Note: *These ratings are bifurcated contact ratings.

Reference

UL approval: UL508 for industrial control devices
UL1950 for information processing equipment including business machines

CSA approval: CSA C22.2 No. 14 for industrial control devices
CSA C22.2 No. 950 for information processing equipment including business machines

VDE (File No. 5381UG)

Model	Coil ratings	Contact ratings	
		NO contact	NC contact
G7J-4A-B(P) (T) (Z) G7J-2A2B(P) (T) G7J-3A1B-B(P) (T) (Z)	6, 12, 24, 48, 100 VDC 24, 50, 100 to 120, 200 to 240 VAC	25 A 240 VAC cosϕ = 0.4 25 A 240 VAC cosϕ = 1 25 A 30 VDC L/R ≥ 1 *1 A 240 VAC cosϕ = 0.4	8 A 240 VAC cosϕ = 0.4 8 A 240 VAC cosϕ = 1 8 A 30 VDC L/R ≥ 1 *1 A 240 VAC cosϕ = 0.4

Note: Add the suffix “-KM” to the model number when ordering.

*These ratings are bifurcated contact ratings.

Reference

VDE approval: EN60255-1-00: 1997
EN60255-23: 1996

KEMA (File No. 2001291.02)

Model	Coil ratings	Contact ratings
		NO contact
G7J-4A-B(P) (T) (Z) G7J-2A2B(P) (T)	200 to 240 VAC	Class AC1: 25 A at 220 VAC 11.5 A at 380 to 480 VAC Class AC3: 11.5 A at 220 VAC and 8.5 A at 380 to 480 VAC *Class AC1: 1 A at 220 VAC
G7J-3A1B-B(P) (T) (Z)	6, 12, 24, 48, 100 VDC 24, 50, 100 to 120, 200 to 240 VAC	

Note: Add the suffix "-KM" to the model number when ordering.

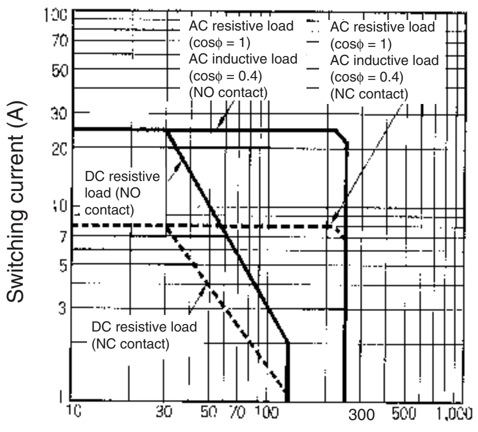
*This rating is the bifurcated contact rating.

Reference

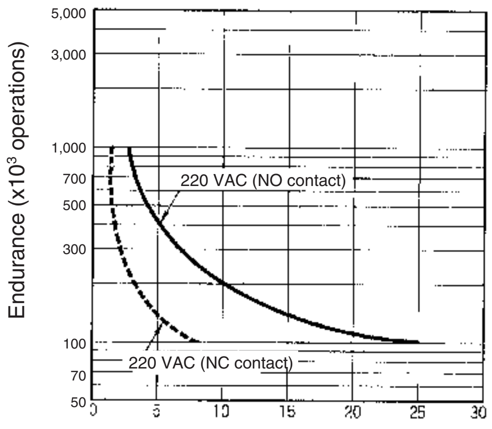
KEMA approval: EN60947-4-1 for contacts
IEC947-4-1 for contacts

Engineering Data

■ Maximum Switching Power

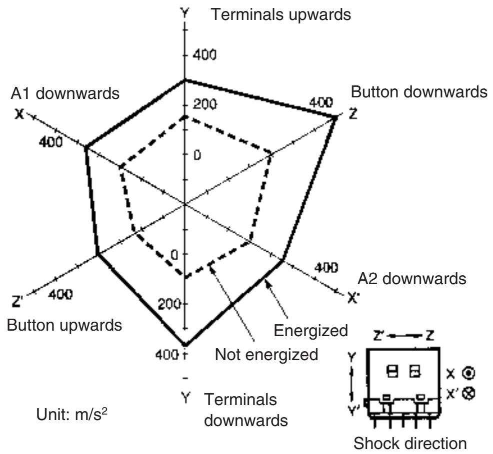


■ Endurance



■ Malfunctioning Shock

G7J-2A2B



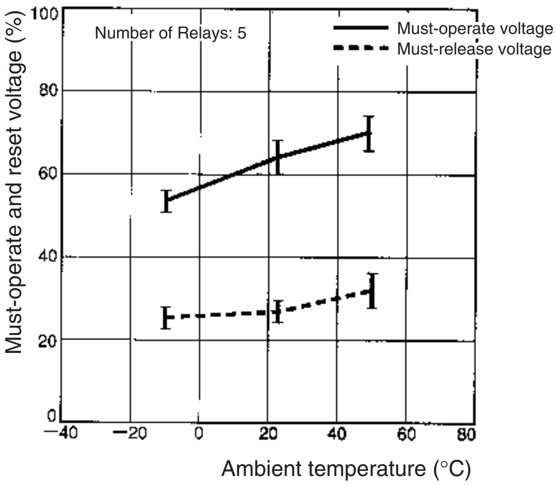
Number of samples: 5

Measurement conditions: Increase and decrease the specified shock gradually imposed in ±X, ±Y, and ±Z directions three times each with the Relay energized and not energized to check the shock values that cause the Relay to malfunction.

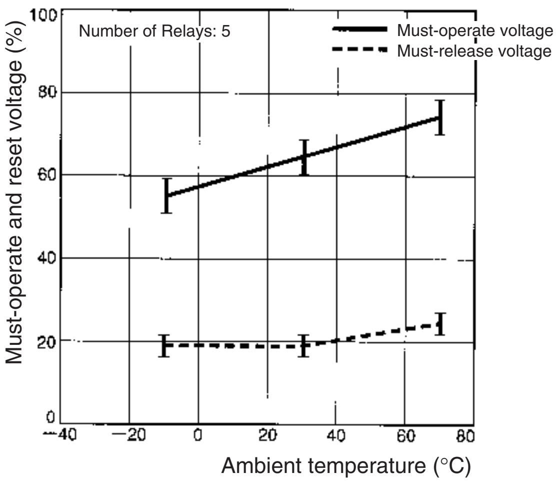
Criteria: There must not be any contact separation for 1 ms or greater with a shock of 100 m/s² imposed when the coil is energized or with a shock of 20 m/s² when the coil is not energized.

■ Ambient Temperature vs. Must-operate and Must-release Voltage

G7J 100 to 120 VAC

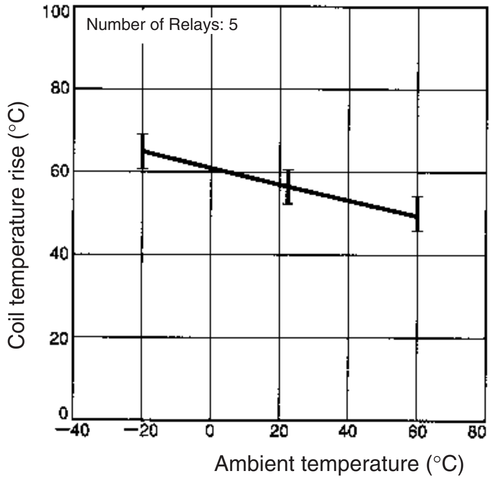


G7J 24 VDC

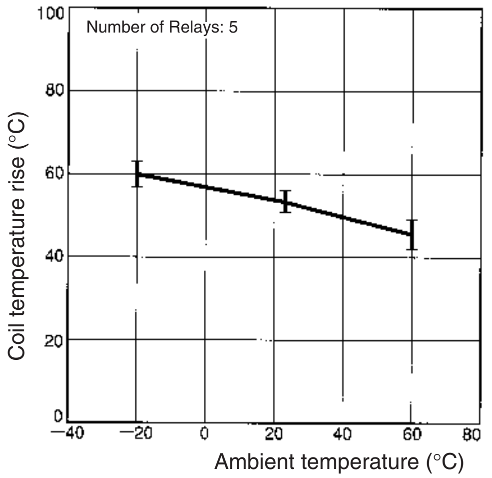


■ Ambient Temperature vs. Coil Temperature Rise

G7J-4A 100 to 120 VAC



G7J-4A 24 VDC



Motor Load

Item	G7J-4A-P, G7J-3A1B-P, G7J-4A-B, G7J-3A1B-B, G7J-4A-T, G7J-3A1B-T
Load	3ϕ, 220 VAC, 2.7 kW (with a inrush current of 78 A and a breaking current of 13 A)
Endurance	Electrical: 100,000 operations min.

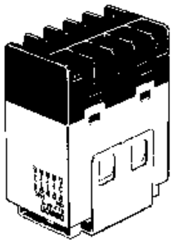
omron

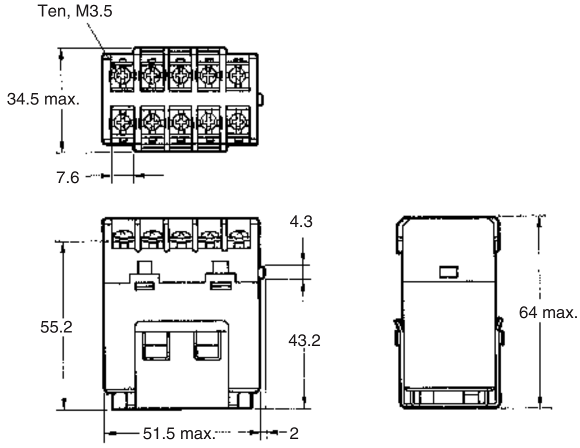
Dimensions

Note: All units are in millimeters unless otherwise indicated.

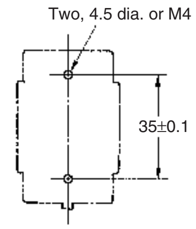
Screw Terminals with W-bracket

G7J-4A-B, G7J-4A-BZ, G7J-3A1B-B, G7J-3A1B-BZ, G7J-2A2B-B



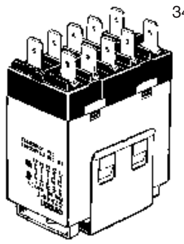


Mounting Holes

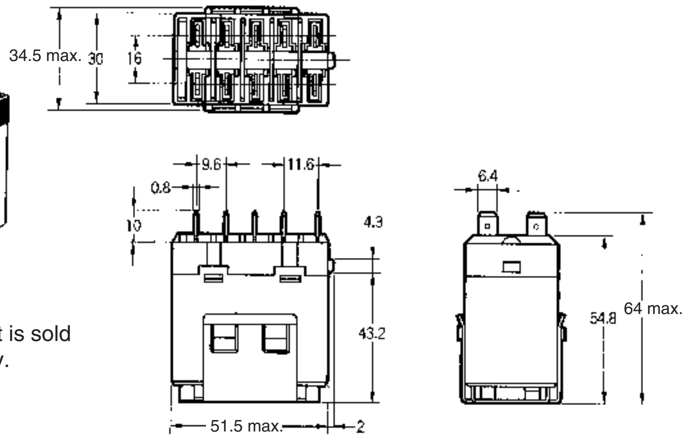


Quick-connect Terminals with W-bracket

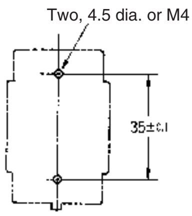
G7J-4A-T, G7J-4A-TZ, G7J-3A1B-T, G7J-3A1B-TZ, G7J-2A2B-T



Note: W-bracket is sold separately.

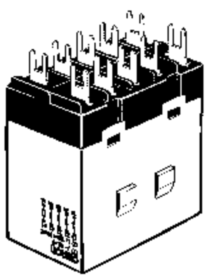


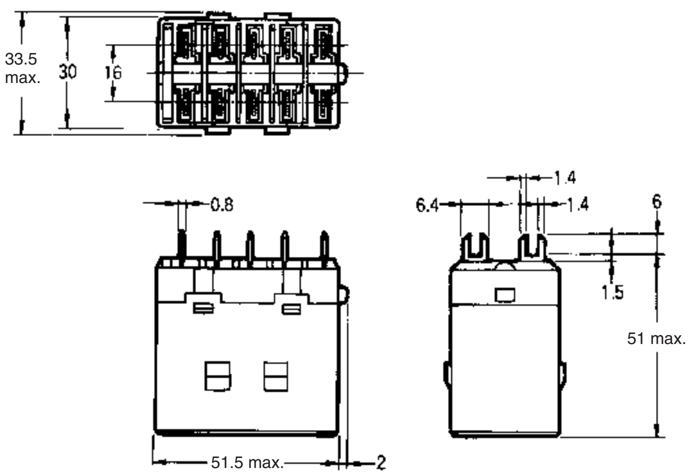
Mounting Holes



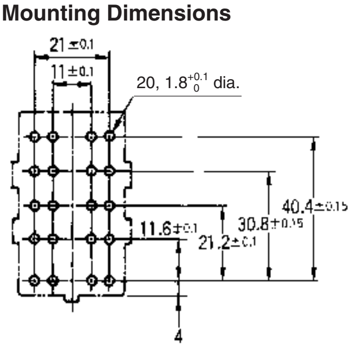
PCB Terminals with PCB Mounting

G7J-4A-P, G7J-4A-PZ, G7J-3A1B-P, G7J-3A1B-PZ, G7J-2A2B-P



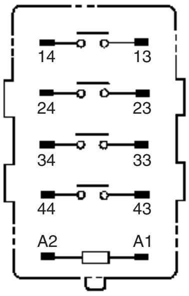


Mounting Dimensions

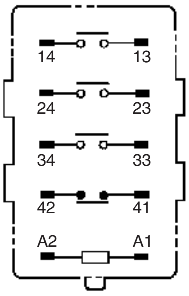


■ Terminal Arrangement/Internal Connections

G7J-4A-P(B) (T) (Z)

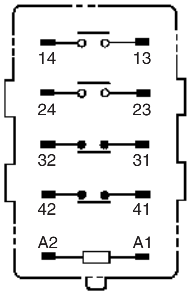


G7J-3A1B-P(B) (T) (Z)



The coil has no polarity.

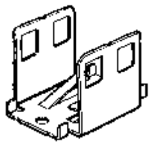
G7J-2A2B-P(B) (T)

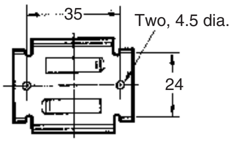


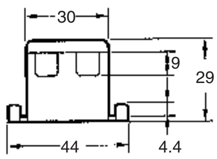
Note: Terminals 43 and 44 of the G7J-4A-P(B)(T)(Z) and contacts 41 and 42 of the G7J-3A1B-P(B)(T)(Z) are bifurcated contacts.

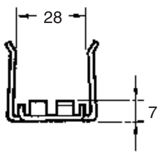
■ Accessories (Order Separately)

R99-04 W-bracket (for G5F)

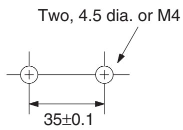








Mounting Holes



Precautions

■ Correct Use

Installation

PCB Terminal-equipped Relays weigh approximately 140 g. Be sure that the PCB is strong enough to support them. We recommend dual-side through-hole PCBs to reduce solder cracking from heat stress.

Mount the G7J with its test button facing downwards. The Relay may malfunction due to shock if the test button faces upwards. Be careful not to press the test button by mistake because the contacts will go ON if the test button is pressed.

Be sure to use the test button for test purposes only.
The test button is used for Relay circuit tests, such as a circuit continuity test. Do not attempt to switch the load with the test button.

Micro Loads

The G7J is used for switching power loads, such as motor, transformer, solenoid, lamp, and heater loads. Do not use the G7J for switching minute loads, such as signals. Use a Relay with a bifurcated contact construction for switching micro loads, in which case, however, only SPST-NO or SPST-NC output is obtained.

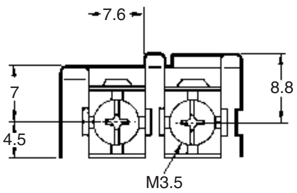
Soldering PCB Terminals

Be sure to solder the PCB terminals manually only. In the case of automatic soldering, some flux may stick to the test button and the G7J. As a result, the G7J may malfunction.

The G7J is not of enclosed construction. Therefore, do not wash the G7J with water or any detergent.

Connecting

Refer to the following diagram when connecting a wire with a screw terminal to the G7J.



Allow suitable slack on leads when wiring, and do not subject the terminals to excessive force.

Tightening torque: 0.98 N·m

Do not impose excessive external force on the G7J in the horizontal or vertical directions when inserting the G7J to the Faston receptacle or pulling the G7J out from the Faston receptacle. Do not attempt to insert or pull out more than one G7J Unit together.

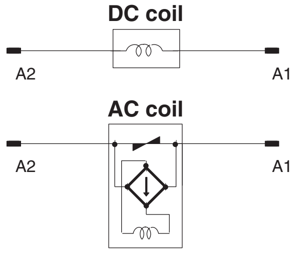
Do not solder the tab terminals.

Terminal	Receptacle	Housing
#250 terminal (6.35 mm in width)	AMP170333-1 (170327-1) AMP170334-1 (170328-1) AMP170335-1 (170329-1)	AMP172076-1: natural AMP172076-4: yellow AMP172076-5: green AMP172076-6: blue

Note: Numbers in parentheses are for air feed use.

Operating Coil

Internal Connections of Coils



If a transistor drives the G7J, check the leakage current, and connect a bleeder resistor if necessary.

The AC coil is provided with a built-in full-wave rectifier. If a triac, such as an SSR, drives the G7J, the G7J may not release. Be sure to perform a trial operation with the G7J and the triac before applying them to actual use.

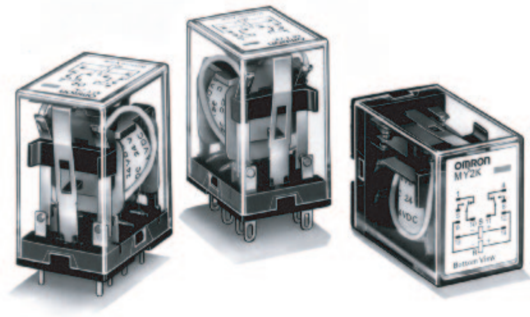
ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. J088-E1-03

General-purpose Latching Relay
MYK

Magnetic Latching Relay Ideal for Memory and Data Transmission Circuits

- Double-winding latch system that holds residual magnetism.
- Changes due to aging are negligible because of use of special magnetic materials, thus ensuring long continuous holding time.
- Little change in characteristics such as contact follow, contact pressure, etc., throughout its long life.
- Excellent vibration/shock resistance.
- Easy monitoring of ON/OFF operation thanks to the built-in operation indicator mechanism.
- Same outline dimensions as the MY Miniature Power Relay.



Ordering Information

■ List of Models

Contact form	Plug-in/solder terminal model	PCB terminal model
DPDT	MY2K	MY2K-02

■ Accessories (Order Separately)

Connecting Sockets

No. of poles	Front-connecting Socket	Back-connecting Socket		
	Screw terminals	Solder terminals	Wire-wrap terminals	PCB terminals
Without Relay Hold-down Clip	PYF14A-E PYF14A PYF14-N	PY14	PY14QN	PY14-02
With Hold-down Clip	---	PY14-Y1	PY14QN-Y1	---

Note: Refer to the MY Datasheet for detail information on the Relay Hold-down Clips and Relay-mounting Sockets.

Specifications

■ Coil Ratings

Rated voltage		Set coil			Reset coil			Must-set voltage	Must-reset voltage	Max. voltage	Power consumption (Approx.)	
		Rated current		Resistance	Rated current		Resistance	% of rated voltage			Set coil	Reset coil
		50 Hz	60 Hz		50 Hz	60 Hz						
AC	12 V	57 mA	56 mA	72 Ω	39 mA	38.2 mA	130 Ω	80% max.	80% max.	110%	0.6 to 0.9 (60 Hz)	0.2 to 0.5 (60 Hz)
	24 V	27.5 mA	26.4 mA	320 Ω	18.6 mA	18.1 mA	550 Ω					
	50 V	14.0 mA	13.4 mA	1,400 Ω	3.5 mA	3.4 mA	3,000 Ω					
	100 V	7.1 mA	6.9 mA	5,400 Ω	3.5 mA	3.4 mA	3,000 Ω					
DC	12 V	110 mA		110 Ω	50 mA		235 Ω				1.3 W	0.6 W
	24 V	52 mA		470 Ω	25 mA		940 Ω					

Note: 1. For AC models, the rated current values are half-wave rectified current values measured with a DC ammeter.
2. The rated current and coil resistance are measured at a coil temperature of 23°C with tolerances of +15%/–20% for AC rated current and ±15% for DC rated current, and +15% for DC coil resistance.
3. The AC coil resistance values are for reference only.
4. Performance characteristic data are measured at a coil temperature of 5°C to 35°C.

■ Contact Ratings

Item	Resistive load (cosφ = 1)	Inductive load (cosφ = 0.4) (L/R = 7 ms)
Rated load	3 A at 220 VAC, 3 A at 24 VDC	0.8 A at 220 VAC, 1.5 A at 24 VDC
Rated carry current	3 A	
Max. switching voltage	250 VAC, 125 VDC	
Max. switching current	3 A	
Max. switching power	660 VA, 72 W	176 VA, 36 W
Failure rate* (reference value)	1 mA at 1 VDC	

***Note:** P level: λ_{60} = 0.1 x 10^{-6}/operation

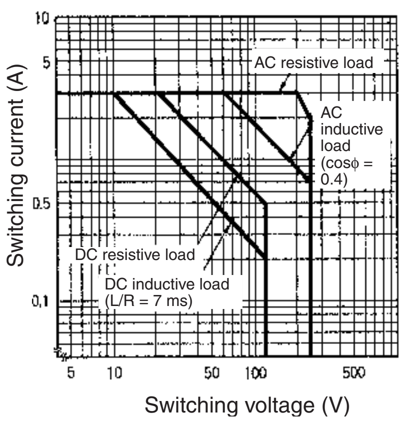
■ Characteristics

Contact resistance	50 mΩ max.	
Set time	Time:	AC: 30 ms max.; DC: 15 ms max.
	Min. pulse width:	AC: 60 ms.; DC: 15 ms.
Reset time	Time:	AC: 30 ms max.; DC: 15 ms max.
	Min. pulse width:	AC: 60 ms.; DC: 15 ms.
Max. operating frequency	Mechanical: 18,000 operations/hr Electrical: 1,800 operations/hr (under rated load)	
Insulation resistance	100 MΩ min. (at 500 VDC)	
Dielectric strength	1,500 VAC, 50/60 Hz for 1 min (1,000 VAC between contacts of same polarity and between set and reset coils)	
Vibration resistance	Destruction: 10 to 55 to 10 Hz, 0.5 mm single amplitude (1.0 mm double amplitude) Malfunction: 10 to 55 to 10 Hz, 0.5 mm single amplitude (1.0 mm double amplitude)	
Shock resistance	Destruction: 1,000 m/s^2 Malfunction: 200 m/s^2	
Endurance	Mechanical: 100,000,000 operations min. (at 18,000 operations/hr) Electrical: 200,000 operations min. (at 1,800 operations/hr)	
Ambient temperature	Operating: –55°C to 60°C (with no icing)	
Ambient humidity	Operating: 5% to 85%	
Weight	Approx. 30 g	

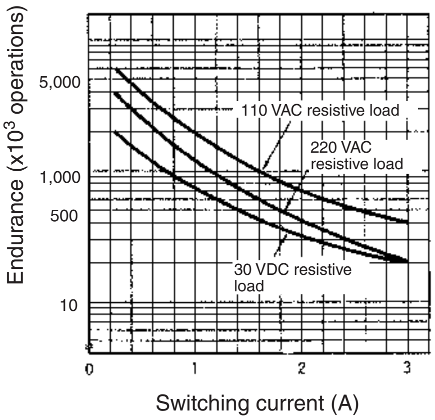
Note: The data shown above are initial values.

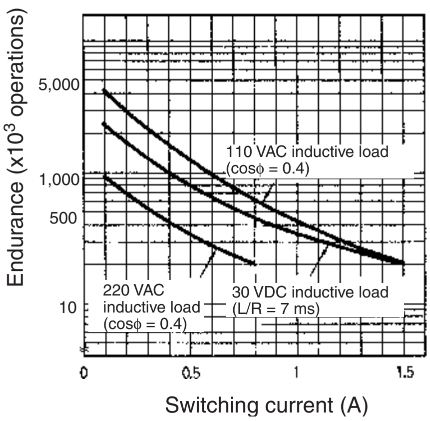
Engineering Data

Maximum Switched Power



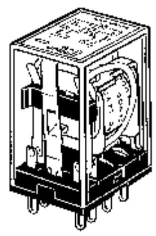
Endurance

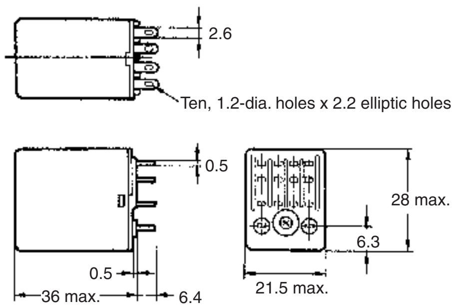




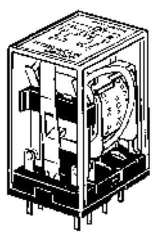
Dimensions

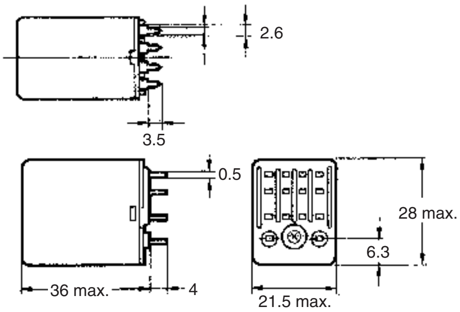
MY2K



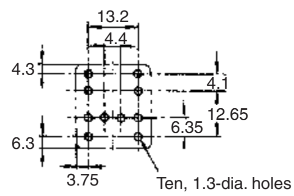


MY2K-02





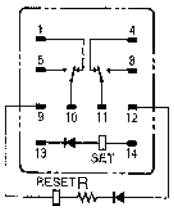
Mounting Holes (Bottom View)



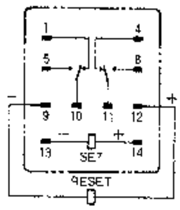
Note: Dimensional tolerances are ±0.1 mm.

Terminal Arrangement/Internal Connections (Bottom View)

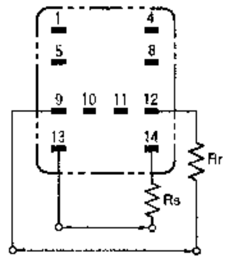
AC Model



DC Model



Use at 220 VAC



Rs: 7.3 kΩ 3 W
Rr: 14.3 kΩ 1 W

Note: 1. Resistor is for ampere-turn compensation and is incorporated in the Relay rated at 50 VAC or above.

2. Pay attention to the polarity of the set and reset coils, as incorrect connection of positive and negative terminal will result in the Relay malfunctioning.

When using the Relay rated at 110 VAC at a supply voltage of 220 VAC, be sure to connect external resistors Rs and Rr to the Relay.

If the supply voltage is applied to the set and reset coils at the same time, the Relay will be put in the set state.

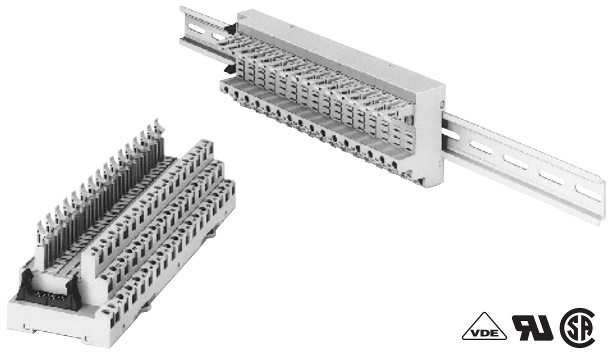
ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

 In the interest of product improvement, specifications are subject to change without notice.

I/O Block Base
G70A

Reduces Wiring while Providing I/O Flexibility

- Mount I/O relays and I/O SSRs freely.
- Electric-shock preventive (finger-touch protection) terminal block incorporated conforming to VDE 0160.
- Connects to the PC and SBC easily via a connector.
- DIN track mounted.
- I/O Block conforming to VDE 0160.



Ordering Information

■ List of Models

Classification	Internal I/O circuit common	Rated voltage	Model
Output	NPN (+ common)	24 VDC	G70A-ZOC16-3
	PNP (– common)	24 VDC	G70A-ZOC16-4
Input	NPN/PNP	110 VDC max., 240 VAC max. (See note)	G70A-ZIM16-5

Note: Each relay to be mounted must incorporate a coil that has proper specifications within the maximum rated voltage range.

■ Suitable Relay/SSR

Classification	I/O Block Base	PCB Relay	Solid State Relay
Output	NPN:G70A-ZOC16-3 PNP:G70A-ZOC16-4	G2R-1-S G2R-1-SN	G3R-OA202SZN G3R-OA202SLN G3R-ODX02SN G3R-OD201SN G3RZ-201SLN H3RN-1 H3RN-11
Input	G70A-ZIM16-5	G2R-1A3-SN G2R-13-SN G2R-1A3-SND G2R-13-SND	G3R-IAZR1SN G3R-IDZR1SN G3R-IDZR1SN-1

Note: G2R-13-SN has twin cross-bar contacts.

■ Connecting Sockets for I/O Terminal Expansion

Model	Number of poles
P2RF-05-E	1 pole (G2R: 1 pole usage)
P2RF-08-E	2 poles (G2R: 2 poles usage)

■ Accessories (Order Separately)

G78-16-E Short Bar

Applicable model	Model
G70A-ZOC16-3 G70A-ZOC16-4	G78-16-E
G70A-ZIM16-5	

Specifications

■ Ratings/Characteristics

Item	G70A-ZOC16-3	G70A-ZOC16-4	G70A-ZIM16-5
Contact resistance	10 mΩ (excluding the resistance of the relay to be used)		
Permissible current	10 A		100 mA
Max. operating voltage	380 VAC, 125 VDC		30 VDC
Dielectric strength	4,000 VAC, 50/60 Hz for 1 min between connector and output terminals 2,000 VAC, 50/60 Hz for 1 min between output terminals 250 VAC, 50/60 Hz for 1 min between connectors		4,000 VAC, 50/60 Hz for 1 min between connector and input terminals 2,000 VAC, 50/60 Hz for 1 min between coil terminals 250 VAC, 50/60 Hz for 1 min between connectors
Insulation resistance	Between connector and I/O terminals: 1,000 MΩ (at 500 V) Other: 100 MΩ (at 500 V)		
Vibration resistance	Malfunction: 10 to 61.2 to 10 Hz, 0.1-mm single amplitude (0.2-mm double amplitude); 61.2 to 150 to 61.2 Hz, 14.7 m/s^2		
Shock resistance	Malfunction: 200 m/s^2		
Noise immunity	Noise level: 2.0 kV; pulse width: 100 ns to 1 µs		
Ambient temperature	Operating: 0°C to 55°C (with no icing)		
Ambient humidity	Operating: 35% to 85%		
Coil surge absorption element	Diode: 1 A, 400 V		Varistor (see note)
Protection diode for inverse connection	Diode (2 A, withstand inverse voltage: 40 V)		
Tightening torque	0.59 N·m		

Note: Use a DC relay with a built-in diode because a DC relay without a built-in diode does not absorb any coil surge.

■ Relay (G2R-1-S, G2R-1-SN)

Coil Ratings

Rated voltage		24 VDC
Rated current		21.8 mA
Coil resistance		1,100 Ω
Coil inductance	**Armature OFF**	4.27
(H) (ref. value)	**Armature ON**	8.55
Must operate voltage		70% min. of rated voltage
Must release voltage		15% min. of rated voltage
Max. voltage		110% of rated voltage
Power consumption		Approx. 0.53 W

Contact Ratings

Number of poles	1 pole	
Load	Resistive load (cosϕ = 1)	Inductive load (cosϕ = 0.4; L/R = 7 ms)
Rated load	10 A at 250 VAC; 10 A at 30 VDC	7.5 A at 250 VAC; 5 A at 30 VDC
Rated carry current	10 A	
Max. operating voltage	380 VAC, 125 VDC	
Max. operating current	10 A	
Max. switching capacity	2,500 VA, 300 W	1,875 VA, 150 W
Min. permissible load	100 mA at 5 VDC	

■ Relay (G2R-1A3-SN (SND), G2R-13-SN (SND))

Coil Ratings

Rated voltage		230 VAC	12 VDC	24 VDC
Rated current	**50 Hz**	3.7 mA	43.6 mA	21.8 mA
	60 Hz	3.1 mA		
Coil resistance		30,000 Ω	275 Ω	1,100 Ω
Must operate voltage		80% max. of rated voltage	70% max. of rated voltage	
Must release voltage		30% min. of rated voltage	15% min. of rated voltage	
Max. voltage		110% of rated voltage		
Power consumption		Approx. 0.7 W (60 Hz)	Approx. 0.53 W	

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of $^{+15\%}/_{-20\%}$ (AC rated current) or ±10% (DC coil resistance).
2. LEDs are used for the built-in operation indicator. For models equipped with these indications, the VAC rated current must be increased by approximately 1 mA; the VDC rated current, by approximately 4 mA.
3. Operating characteristics are measured at a coil temperature of 23°C.

Contact Ratings

Refer to Ratings/Characteristics of G70A-ZIM16-5.

■ SSR

Ratings

Input Module

Input

Model	Rated voltage	Operating voltage	Input current	Must operate voltage	Must release voltage
G3R-IAZR1SN	100 to 240 VAC	60 to 264 VAC	15 mA max.	60 VAC max.	20 VAC min.
G3R-IDZR1SN	5 VDC	4 to 6 VDC	8 mA max.	4 VDC max.	1 VDC min.
	12 to 24 VDC	6.6 to 32 VDC		6.6 VDC max.	3.6 VDC min.
G3R-IDZR1SN-1	5 VDC	4 to 6 VDC		4 VDC max.	1 VDC min.
	12 to 24 VDC	6.6 to 32 VDC		6.6 VDC max.	3.6 VDC min.

Output

Model	Logic level supply voltage	Logic level supply current
G3R-IAZR1SN	4 to 32 VDC	0.1 to 100 mA
G3R-IDZR1SN		
G3R-IDZR1SN-1		

Output Module

Input

Model	Rated voltage	Operating voltage	Input current	Must operate voltage	Must release voltage
G3R-OA202SZN	5 to 24 VDC	4 to 32 VDC	15 mA max. (at 25°C)	4 VDC max.	1 VDC min.
G3R-OA202SLN					
G3R-ODX02SN			8 mA max.		
G3R-OD201SN					

Output

Model	Load voltage	Load current (see note)	Inrush current
G3R-OA202SZN	75 to 264 VAC	0.05 to 2 A	30 A (60 Hz, 1 cycle)
G3R-OA202SLN			
G3R-ODX02SN	4 to 60 VDC	0.01 to 2 A	8 A (10 ms)
G3R-OD201SN	40 to 200 VDC	0.01 to 1.5 A	8 A (10 ms)

Note: The minimum current value is measured at 10°C min.

■ Characteristics

Input Module

Item	G3R-IAZR1SN	G3R-IDZR1SN	G3R-IDZR1SN-1
Operate time	20 ms max.	0.1 ms max.	15 ms max.
Release time	20 ms max.	0.1 ms max.	15 ms max.
Response frequency	10 Hz	1 kHz	10 Hz
Output ON voltage drop	1.6 V max.		
Leakage current	5 µA max.		
Insulation resistance	100 MΩ min. between input and output		
Dielectric strength	4,000 VAC, 50/60 Hz for 1 min between input and output		
Vibration resistance	10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude)		
Shock resistance	1,000 m/s^2		
Ambient temperature	Operating: –30°C to 80°C (with no icing) Storage: –30°C to 100°C (with no icing)		
Approved standards	UL508 File No. E64562 CSA C22.2 (No. 14, No. 950) File No. LR35535 TÜV File No. R9650094 (EN60950)		
Ambient humidity	Operating: 45% to 85%		
Weight	Approx. 18 g		

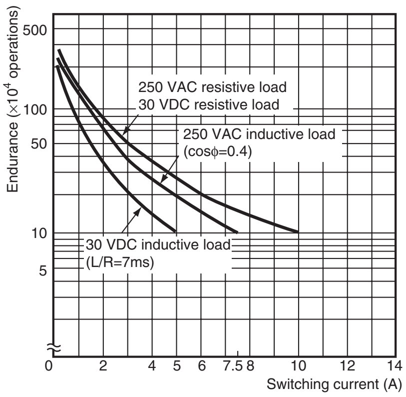
Output Module

Item	G3R-OA202SZN	G3R-OA202SLN	G3R-ODX02SN	G3R-OD201SN
Operate time	1/2 of load power source cycle + 1 ms max.	1 ms max.		
Release time	1/2 of load power source cycle + 1 ms max.		2 ms max.	
Response frequency	20 Hz		100 Hz	
Output ON voltage drop	1.6 V max.			2.5 V max.
Leakage current	1.5 mA max.		1 mA max.	
Insulation resistance	100 MΩ min. between input and output			
Dielectric strength	4,000 VAC, 50/60 Hz for 1 min between input and output			
Vibration resistance	10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude)			
Shock resistance	1,000 m/s^2			
Ambient temperature	Operating: –30°C to 80°C (with no icing) Storage: –30°C to 100°C (with no icing)			
Approved standards	UL508 File No. E64562 CSA C22.2 (No. 14, No. 950) File No. LR35535 TÜV File No. R9650094 (EN60950)			
Ambient humidity	Operating: 45% to 85%			
Weight	Approx. 18 g			

Engineering Data

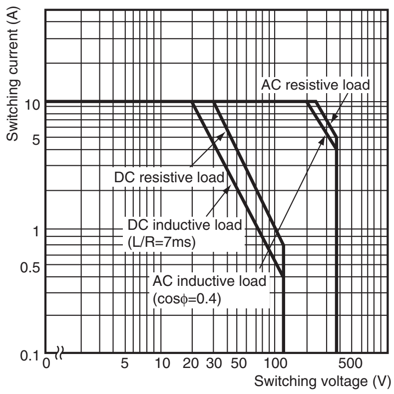
■ When Mounted to a G2R

Endurance



Maximum Switching Power

G2R-1A-S (24 VDC)

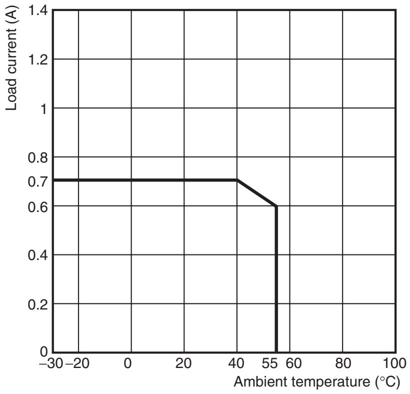


Note: The characteristics shown here are for 16-point mounting. This data was produced from actual values sampled on production lines, and should be used for reference purposes only.
Since relays are mass-produced, a certain amount of tolerance is generally allowed in their application.

■ When Mounted to a G3RZ

Load Current vs. Ambient Temperature

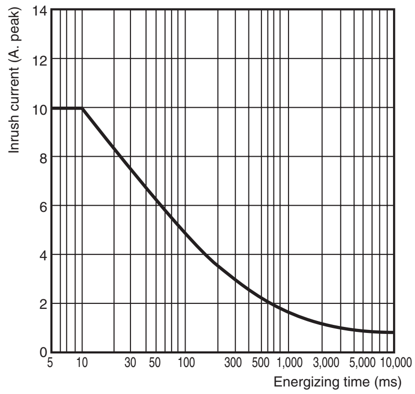
G3RZ-201SLN



Inrush Current Resistivity

Non-repetitive (Keep the inrush current to half the rated value if it occurs repetitively.)

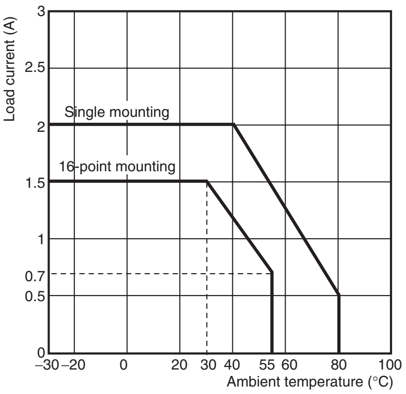
G3RZ-201SLN



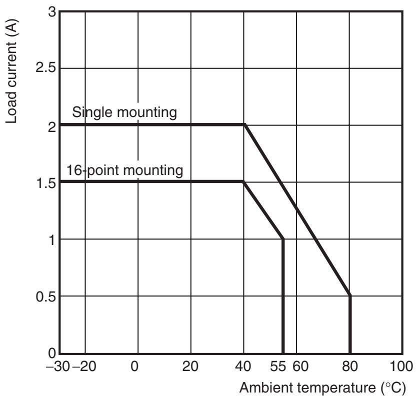
■ When Mounted to a G3R

Load Current vs. Ambient Temperature

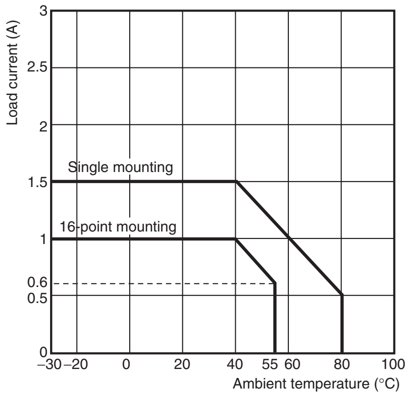
G3R-OA202SZN
G3R-OA202SLN



G3R-ODX02SN



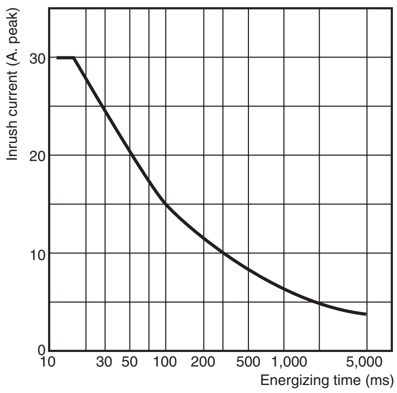
G3R-OD201SN



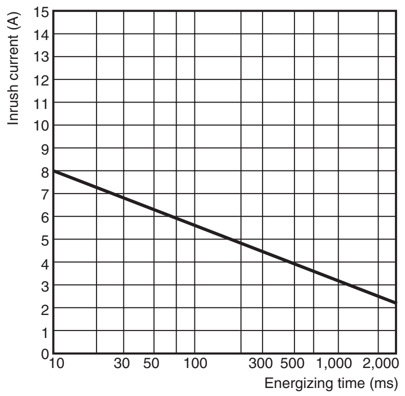
Inrush Current Resistivity

Non-repetitive (Keep the inrush current to half the rated value if it occurs repetitively.)

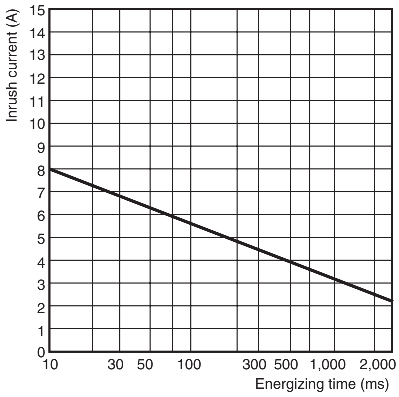
G3R-OA202SZN
G3R-OA202SLN



G3R-ODX02SN



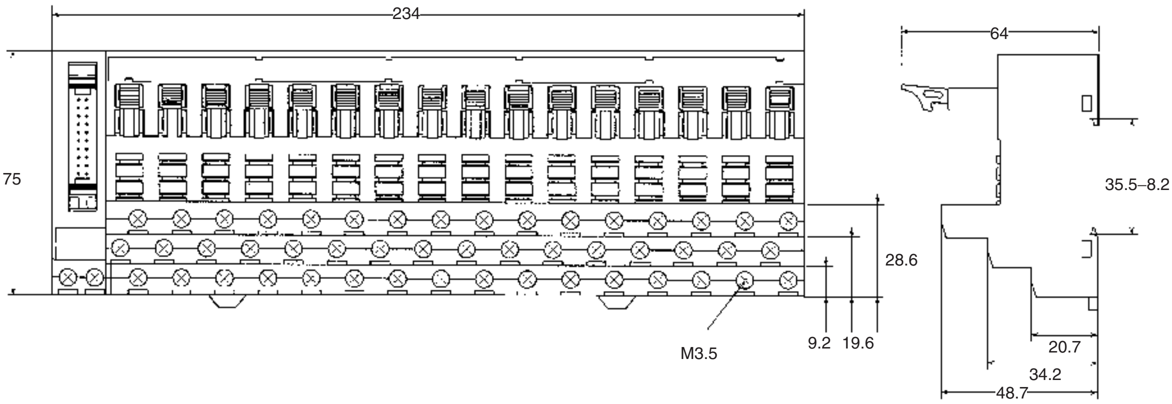
G3R-OD201SN



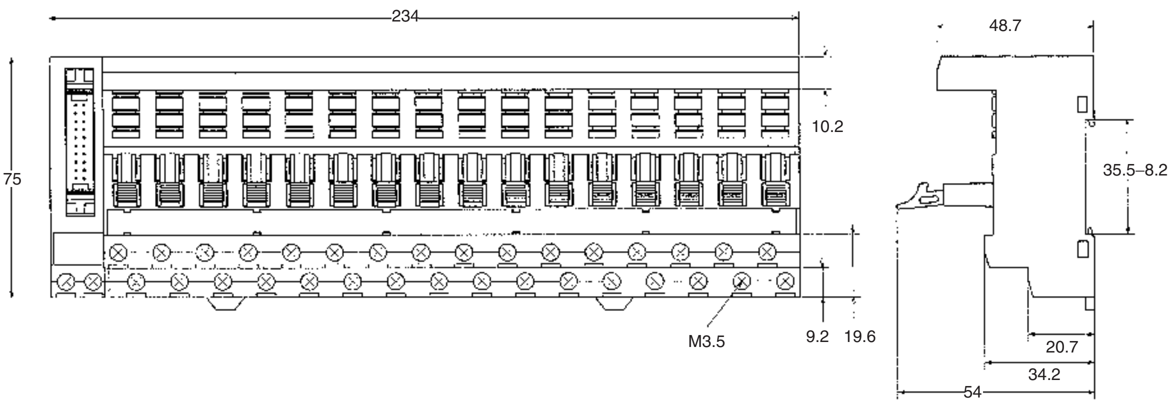
Dimensions

Note: All units are in millimeters unless otherwise indicated.

G70A-ZOC16 (Output)

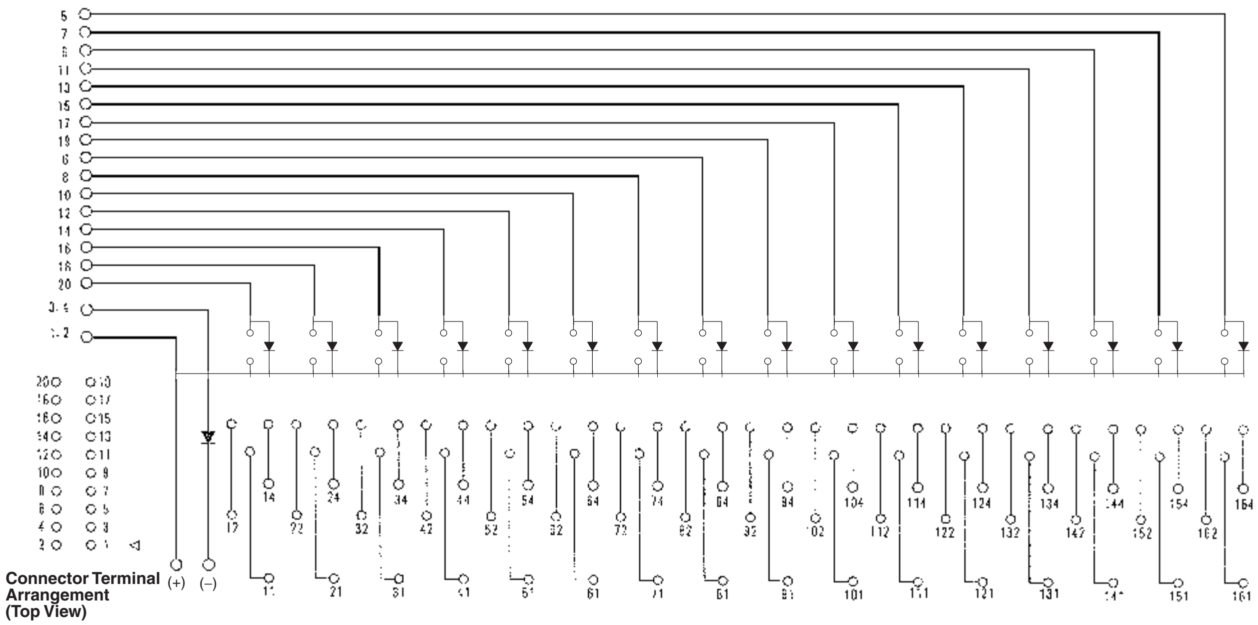


G70A-ZIM16 (Input)

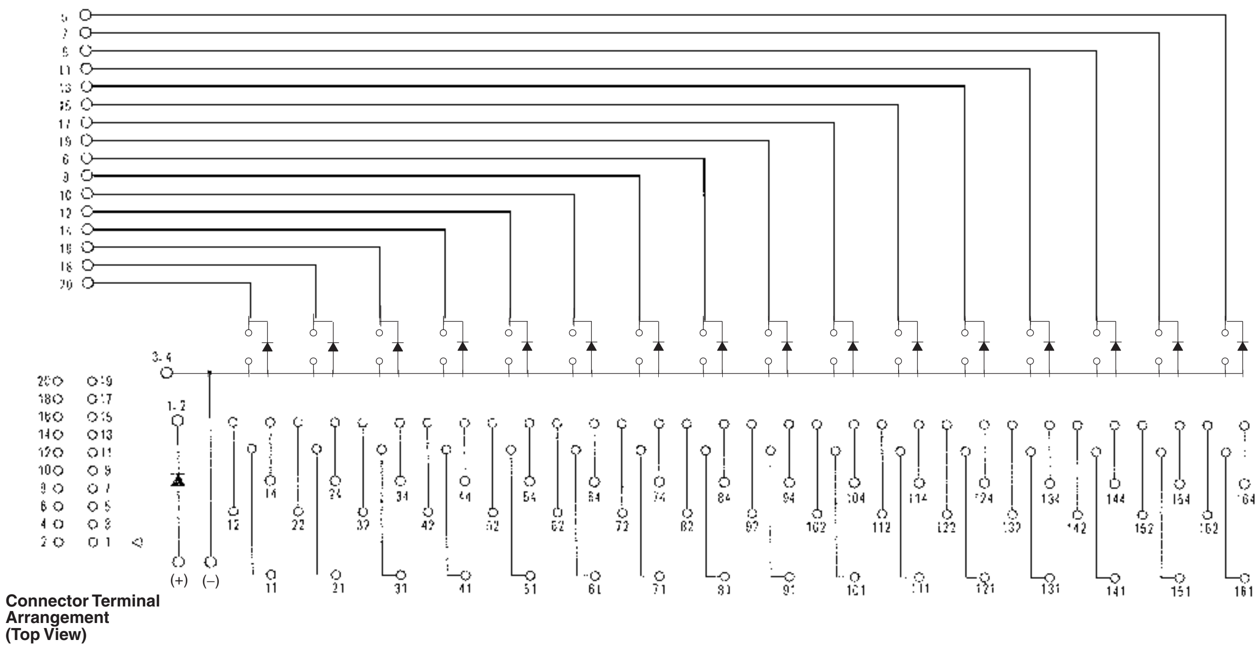


Terminal Arrangement/Internal Connection

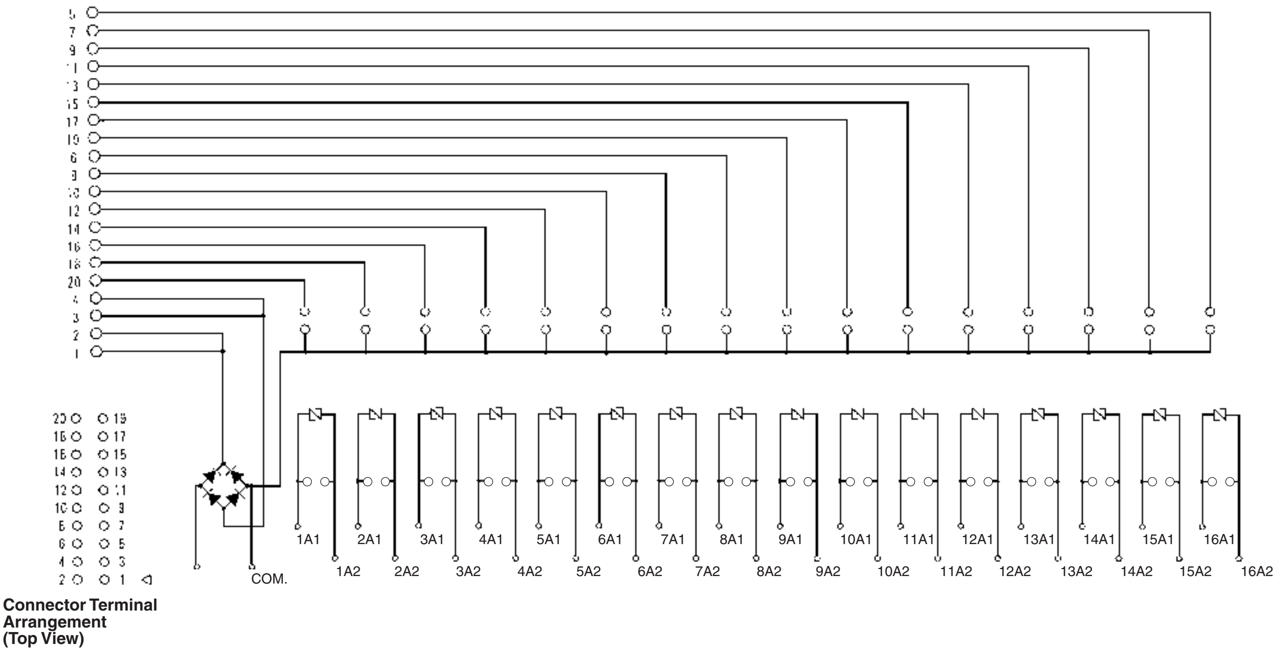
G70A-ZOC16-3 (NPN)



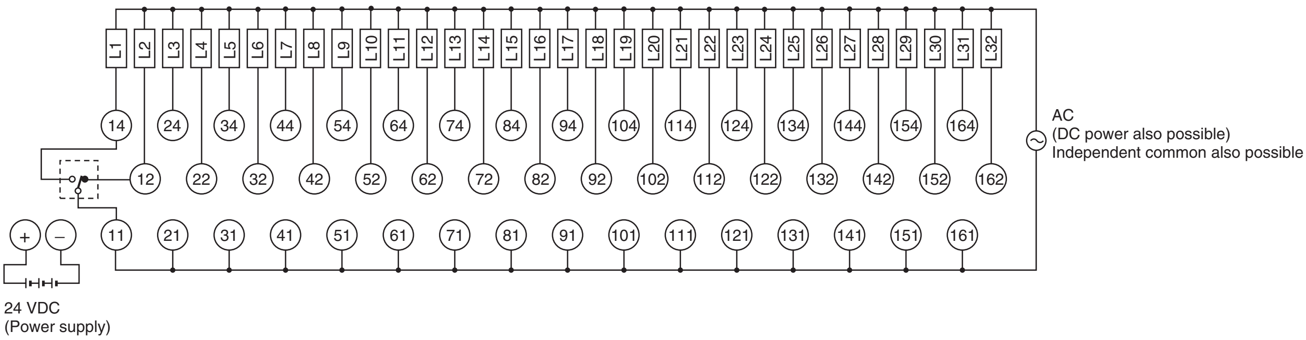
G70A-ZOC16-4 (PNP)



G70A-ZIM16-5 (NPN/PNP)



When mounted to a G2R-1-S



Note: The above diagram shows the Unit mounted to a G2R-1-S.
When mounting to a G3R-OA□ or G3RZ-201SLN, pins 11 to 14 are output terminals.
When mounting to a G3R-OD□, pin 14 is a plus terminal and pin 11 is a minus terminal. When mounting to G3RZ-201SLN, there is no polarity.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. J087-E1-03

Relays
Technical Information

Glossary

Contacts

Contact Form

The contact mechanism of the Relay.

Number of Contact Poles

The number of contact circuits.

Rated Load

The rated load of the contact of the Relay, which determines the characteristic performance of the contact of the Relay, is expressed by the switching voltage and switching current.

Maximum Switching Voltage

The switching voltage of the Relay determines the characteristic performance of the contact of the Relay. Do not apply voltage that exceeds the maximum switching voltage of the Relay.

Carry Current

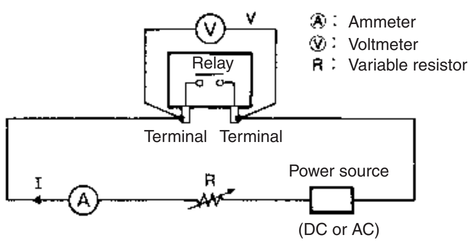
The value of the current which can be continuously applied to the Relay contacts without opening or closing them, which also allows the Relay to stay within the permissible temperature rise limit.

Maximum Switching (Contact) Current

A current which serves as a reference in determining the performance of the Relay contacts. This value will never exceed the carry current. When using a Relay, plan not to exceed this value.

Contact Resistance

The total resistance of the conductor, which includes specific resistivities, such as of the armature and terminal, and the resistance of the contacts. This value is determined by measuring the voltage drop across the contacts by the allowed test current shown in the table below.

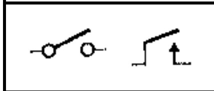
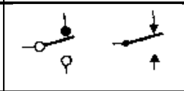
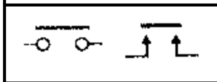
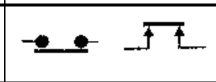
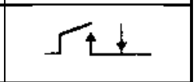
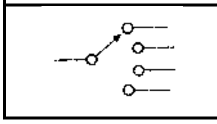
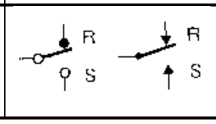
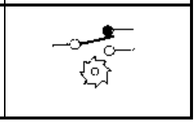


Test Current

Rated current or switched current (A)	Test current (mA)
0.01 or higher but less than 0.1	10
0.1 or higher but less than 1	100
1 or higher	1,000

To measure the contact resistance, a milliohmmeter can be also used, though the accuracy drops slightly.

Contact Symbol

NO contact	NC contact	SPDT contact
		
Double-break NO contact	**Double-break NO contact**	**Make-before-break contact**
		
Wiper contact	**Latching Relay contact**	**Ratchet Relay contact**
		

Make-before-break Contact

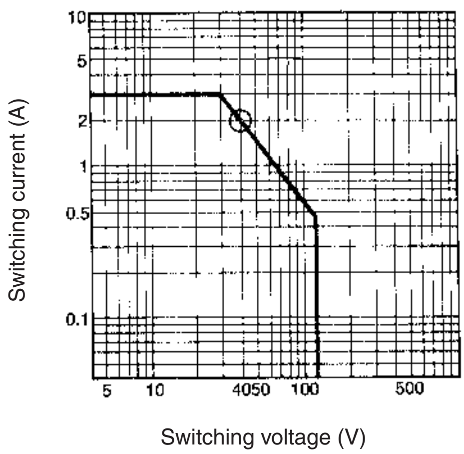
A contact arrangement in which part of the switching section is shared between both an NO and an NC contact. When the Relay operates or releases, the contact that closes the circuit operates before the contact that opens the circuit releases. Thus both the contacts are closed momentarily at the same time.

Maximum Switching Power

The maximum capacity value of the load which can be switched without causing problems of material break-down and/or electrical overload. When using a Relay, be careful not to exceed this value. For example, when switching voltage V_1 is known, max. switching current I_1 can be obtained at the point of intersection on the characteristic curve "Maximum switching power" below. Conversely, max. switching voltage V_1 can be operated if I_1 is known.

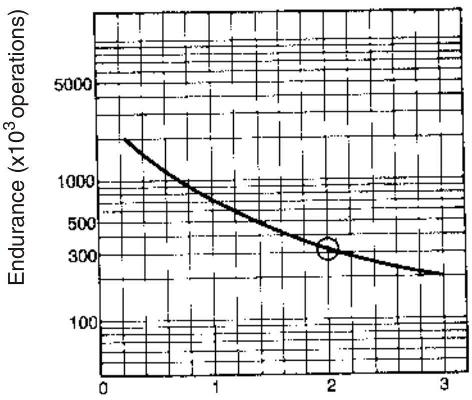
$$\text{Max. switching current } (I_1) = \frac{\text{Maximum switching power [W(VA)]}}{\text{Switching voltage } (V_1)}$$

For instance, if the switching voltage = 40 V, the max. switching current = 2 A (see circled point on graph).



Electrical Endurance

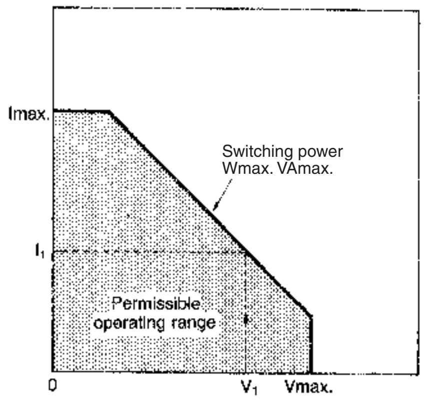
The electrical endurance of the Relay can be determined from the "Electrical life" curve shown below, based on the rated switching current (I_1) obtained above.
For instance, the electrical endurance for the max. switching current of 2 A is slightly over 300,000 operations (see circled point on graph below).



Switching current (A)

However, with a DC load, it may become difficult to break a circuit of 48 V or more, due to arcing. Determine suitability of the Relay in actual usage testing. Correlation between the contact ratings is as shown below.

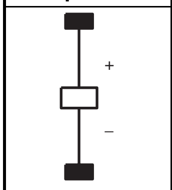
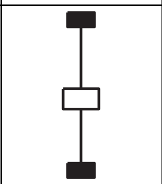
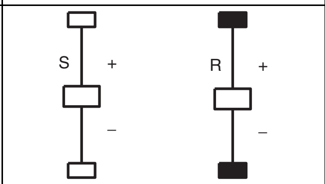
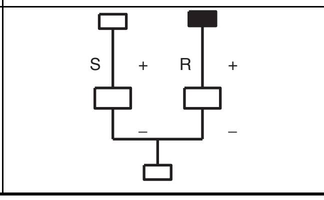
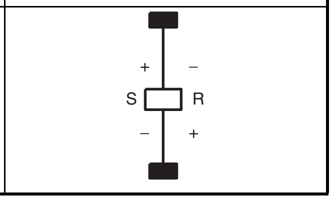
Maximum Switching Power



Failure Rate

The failure rate indicates the lower limit of the switching power of a Relay. Such minute load levels are found in microelectronic circuits. This value may vary, depending on operating frequency, operating conditions, expected reliability level of the Relay, etc. It is always recommended to double-check Relay suitability under actual load conditions.
In this catalog, the failure rate of each Relay is indicated as a reference value. It indicates error level at a reliability level of 60% (γ_{60}).
$\gamma_{60} = 0.1 \times 10^{-6}$/operation means that one error is presumed to occur per 10,000,000 operations at the reliability level of 60%.

Coil

Single-stable		Double-winding		Single-winding latching
With pole	**Without pole**	**4 terminals**	**3 terminals**	
				

Coil Current (Applicable to AC-switching Type Only)

A current which flows through the coil when the rated voltage is applied to the coil at a temperature of 23°C. The tolerance is +15%, -20% unless otherwise specified.

Coil Voltage

A reference voltage applied to the coil when the Relay is used under the normal operation conditions. The following table lists the 100/110 VAC voltages.

Applicable power source	Inscription on Relay	Denomination in catalog
100 V 50 Hz	100 VAC 60 Hz	100 VAC 60 Hz
100 VAC 50 Hz 100 VAC 60 Hz	100 VAC	100 VAC
100 VAC 50 Hz 100 VAC 60 Hz 110 VAC 60 Hz	100/110 VAC 60 Hz 100 VAC 50 Hz	100/(110) VAC
100 VAC 50 Hz 100 VAC 60 Hz 110 VAC 50 Hz 110 VAC 60 Hz	100/110 VAC	100/110 VAC

Power Consumption

The power (=rated voltage x rated current) consumed by the coil when the rated voltage is applied to it. A frequency of 60 Hz is assumed if the Relay is intended for AC operation.
The current flows through the coil when the rated voltage is applied to the coil at a temperature of 23°C and with a tolerance of +15% and -20% unless otherwise specified.

Coil Resistance (Applicable to DC-switching Type Only)

The resistance of the coil measured at a temperature of 23°C with a tolerance of ±10% unless otherwise specified. (The coil resistance of an AC-switching Relay may be given for reference when the coil inductance is specified.)

Must-release (Must-reset) Voltage

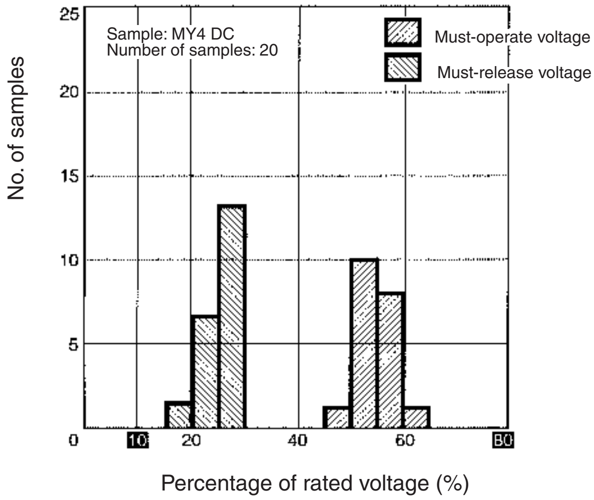
The threshold value of a voltage at which a Relay releases when the rated input voltage applied to the Relay coil in the operating state is decreased gradually.

Must-operate (Must-set) Voltage

The threshold value of a voltage at which a Relay operates when the input voltage applied to the Relay coil in the reset state is increased gradually.

Example: MY4 DC Models

The distributions of the must-operate voltage and the must-release voltage are shown in the following graph.
As shown in the graph, the Relay operates at voltages less than 80% of the rated voltage and releases at voltages greater than 10% of the rated voltage. Therefore, in this catalog, the must-operate and must-release voltages are taken to be 80% max. and 10% min. respectively of the rated voltage.



Hot Start

The ratings set forth in the catalog or data sheet are measured at a coil temperature of 23°C unless otherwise specified. However, some catalogs have the description “Hot start 85% (at Ta = 40°C)”. This means that the must-operate voltage when the Relay is operated after the rated current is consecutively applied to the coil at an ambient temperature of 40°C satisfies a maximum of 85% of the rated must-operate voltage.

Maximum Switching Voltage

The maximum value (or peak value, not continuous value) of permissible voltage fluctuations in the operating power supply of the Relay coil.

Minimum Pulse Width

The minimum width of the pulsating voltage required to set and reset a Latching Relay at a temperature of 23°C.

Coil Inductance

With DC Relays, the coil inductance is obtained by adding the square waveform to a time constant. With AC Relays, it is the value at the rated frequency. In both cases, the values will be different depending on whether the Relay is in the set or the reset condition.

Electrical Characteristics

Mechanical Endurance

The life of a Relay when it is switched at the rated operating frequency, but without the rated load.

Electrical Endurance

The life of a Relay when it is switched at the rated operating frequency, with the rated load applied to its constants.

Bounce

Bouncing is the intermittent opening and closing between contacts caused by vibration or shock resulting from collision between the Relay’s moving parts (poles and terminals) and the iron core and backstop, and collision between contacts.

Operate Bounce Time

The bounce time of the normally open (NO) contact of a Relay when the rated coil voltage is applied to the Relay coil, at an ambient temperature of 23°C.

Operate Time

The time that elapses after power is applied to a Relay coil until the NO contacts have closed, at an ambient temperature of 23°C. Bounce time is not included. For the Relays having an operate time of less than 10 ms, the mean (reference) value of its operate time is specified as follows:

Operate time	5 ms max. (mean value: approx. 2.3 ms)

Release Bounce Time

The bounce time of the normally closed (NC) contact of a Relay when the coil is deenergized at an ambient temperature of 23°C.

Release Time

The time that elapses between the moment a Relay coil is deenergized until the NC contacts have closed, at an ambient temperature of 23°C. (With a Relay having SPST-NO or DPST-NO contacts, this is the time that elapses until the NO contacts have operated under the same condition.) Bounce time is not included. For Relays having a release time of less than 10 ms, the mean (reference) value of its release time is specified as follows:

Release time	5 ms max. (mean value: approx. 2.3 ms)

Reset Time (Applicable to Latching Relays Only)

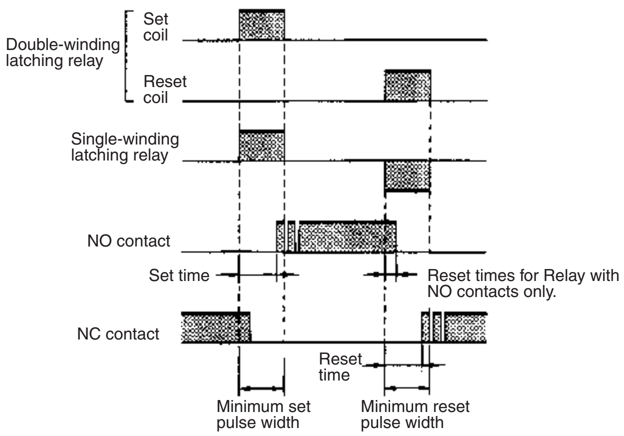
The time that elapses from the moment a Relay coil is deenergized until the NC contacts have closed, at an ambient temperature of 23°C. (With a Relay having SPST-NO or DPST-NO contacts, this is the time that elapses until the NO contacts have operated under the same condition.) Bounce time is not included. For Relays having an operate time of less than 10 ms, the mean (reference) value of its operate time is specified as follows:

Reset time	5 ms max. (mean value: approx. 2.3 ms)

Set Time (Applicable to Latching Relays Only)

The time that elapses after power is applied to a Relay coil until the NO contacts have closed, at an ambient temperature or 23°C. Bounce time is not included. For the Relays having an operate time of less than 10 ms, the mean (reference) value of its operate time is specified as follows:

Set time	5 ms max. (mean value: approx. 2.3 ms)



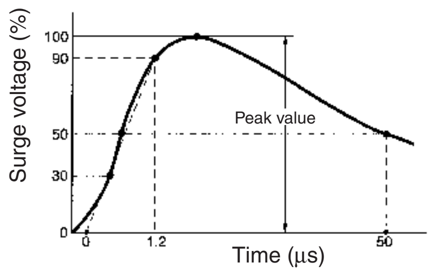
Dielectric Strength

The critical value which a dielectric can withstand without rupturing, when a high-tension voltage is applied for 1 minute between the following points:
Between coil and contact
Between contacts of different polarity
Between contacts of same polarity
Between set coil and reset coil
Between current-carrying metal parts and ground terminal

Note that normally a leakage current of 3 mA is detected; however, a leakage current of 1 mA or 10 mA may be detected on occasion.

Impulse Withstand Voltage

The critical value which the Relay can withstand when the voltage surges momentarily due to lightning, switching an inductive load, etc. The surge waveform which has a pulse width of +1.2 x 50 µs is shown below:



Insulation Resistance

The resistance between an electric circuit (such as the contacts and coil), and grounded, non-conductive metal parts (such as the core), or the resistance between the contacts. The measured values are as follows:

Rated insulation voltage	Measured value
60 V max.	250 V
61 V min.	500 V

Switching Frequency

The frequency or intervals at which the Relay continuously operates and releases, satisfying the rated mechanical and electrical service lives.

Shock Resistance

The shock resistance of a Relay is divided into two categories:
Destruction, which quantifies the characteristic change of, or damage to, the Relay due to considerably large shocks which may develop during the transportation or mounting of the Relay, and malfunction durability, which quantifies the malfunction of the Relay while it is in operation.

Stray Capacitance

The capacitance measured between terminals at an ambient temperature of 23°C and a frequency of 1 kHz.

Vibration Resistance

The vibration resistance of a Relay is divided into two categories: Destruction, which quantifies the characteristic changes of, or damage to, the Relay due to considerably large vibrations which may develop during the transportation or mounting of the Relay, and Malfunction durability, which quantifies the malfunction of the Relay due to vibrations while it is in operation.

$\alpha = 0.002f^2A$

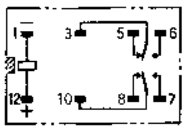
α: Acceleration of vibration
f: Frequency
A: Double amplitude

Operating

Single Stable Relays (Standard Type)

These are Relays in which the contacts switch in response to the energization and deenergization of the coil and do not have any special functions.

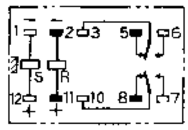
Terminal Arrangement/Internal Connections (Bottom view)



Double-winding Latching Relays

These are Relays that have a set coil and a reset coil, and have a latching mechanism enabling the set or reset condition to be locked.

Terminal Arrangement/Internal Connections (Bottom view)

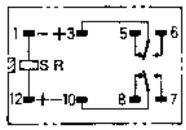


S: set coil
R: reset coil

Single-winding Latching Relays

These are Relays that have one coil, and switch between the set and reset condition according to the polarity of the applied voltage, and have a latching mechanism enabling this status to be locked.

Terminal Arrangement/Internal Connections (Bottom view)



S: set coil
R: reset coil

Stepping Relays

These are Relays in which the contacts shift ON or OFF sequentially with each coil input pulse.

Ratchet Relays

These are Relays in which the contacts alternately turn ON and OFF, or sequentially operate, when a pulse signal is input.

Precautions

General handling

- To maintain initial performance, be careful not to drop the Relay or subject it to shock.
- The case is so constructed that it will not come off with normal handling. To maintain initial performance, do not allow the case to come off.
- Use the Relay in a dry atmosphere containing little dust, SO_2, H_2S, and organic gases.
- Ensure that the voltage applied to the coil is not applied continuously in excess of the maximum permissible voltage.
- With DC-operated Relays that have a built-in diode or a built-in operation indication lamp, do not reverse the polarity connections when the polarity of the coil is specified.
- Do not use the Relay at a voltage or current greater than the specified values.
- Ensure that the ambient operating temperature does not exceed the specified value.
- With General-purpose Relays, leaving or using the Relay for a long time in an atmosphere of hydrogen sulfide gas or high temperature and high humidity will lead to the formation of a sulfide film or an oxidation film on the surface of the contact. In Miniature Relays, the contact force is weak and so the film cannot be destroyed mechanically. Also, with the very small loads, destruction of the film is not possible by arcing and so there will be contact instability and the occurrence of problems in performance and function. For these reasons, Fully Sealed Relays or Hermetically Sealed Relays should be used in atmospheres of harmful gases (such as H_2S, SO_2, NH_3, and Cl_2), humidity, and dust.
- The contact ratings of Relays approved by standards and the general ratings of the Relays could be different.
  When combining Relays with various types of Sockets, check the contact ratings of the Relays before use.

Operating Coils
AC-operated Relays

The power supply used to operate AC-operated Relays is almost always at the commercial frequency (50 or 60 Hz). Standard voltages are 6, 12, 24, 48, 100, and 200 VAC. Because of this, when the voltage is other than a standard voltage, the Relay will be a special-order item and so inconvenience may arise with respect to price, delivery period, and stability of performance. Consequently, a Standard-voltage Relay should be selected if at all possible.
In AC-operated Relays, there is a resistance loss of the shading coil, an overcurrent loss of the magnetic circuit, a hysteresis loss, as well as other losses. The coil input also increases and so in general it is normal for the temperature rise to be higher than in a DC-operated Relay. Also, at voltages less than the must-operate voltage (i.e., the minimum operation voltage), a vibration is produced which necessitates that attention be paid to the fluctuation of the power supply voltage.
For example, when the power supply voltage drops at the time of motor stating, the Relay will be reset while vibrating and the contacts will burn, fuse, or the self holding will go out of place. In AC-operated Relays, there is an inrush current. (When the armature is in a separated condition, the impedance is low and a current flows that is larger than the rated current; when the armature is in the closed condition, the impedance increases and a current flows which is of the rated value.) When a large number of Relays are used connected in series, this factor must be taken into account together with the power consumption.

DC-operated Relays

The power supply used to operate DC-operated Relays may have voltage as a standard or it may have current as a standard. When voltage is the standard, the rated coil voltages include 5, 6, 12, 24, 48, and 100 VDC. When current is the standard, the rated current in mA is listed in the catalog.
In DC-operated Relays, when the Relay is used in an application where it is operated at some limit value, either voltage or current, the current applied to the coil will gradually increase or decrease. It is important to note that this may delay the movement of the contacts resulting in failure to meet the specified control capacity. The coil resistance value of a DC-operated Relay may change by approximately 0.4% per °C due to changes in the ambient temperature and the heat radiated by the Relay itself. Therefore, it is important to note that increases in temperature will be accompanied by higher must-operate and must-release voltages.

Power Supply Capacity

The fluctuation of the power supply voltage over a long period will of course affect Relay operation, but momentary fluctuations will also be the cause of incorrect Relay operation.
For example, when a large solenoid, Relay, motor, heater, or other device is operated from the same power supply as the one that operates the Relay, or when a large number of Relays are used, if the power supply does not have sufficient capacity when these devices are operated simultaneously, the voltage drop may prevent the Relay from operating. On the other hand, when the voltage drop is estimated and the voltage increased accordingly, if the voltage is applied to the Relay when there is no voltage drop, this will cause heating of the coil.
Provide leeway in the capacity of the power supply and keep the voltage within the switching voltage range of the Relay.

Lower Limit Value of the Must-operate Voltage

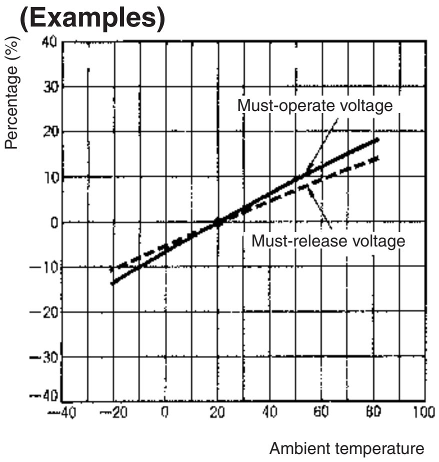
Use of Relays at high temperatures or rise of coil temperature due to a continuous flow of current through the coil will result in an increase in coil resistance which means the must-operate voltage will also increase. This matter requires attention be paid to determining a lower limit value of the operation power supply voltage. The following example and explanation should be referred to when designing the power supply.

Note: Even though the rating is a voltage rating (as is the rating for all Standard Relays), the Relay should be thought of as being current operated.

Catalog values for model MY
Rated voltage: 24 VDC, coil resistance: 650 Ω, must-operate voltage: 80% or less of rated voltage, at a coil temperature of 23°C.

A rated current of 36.9 mA (24 VDC/650 Ω = 36.9 mA) flows through this Relay, which operates at 80% or less of this value i.e., at 29.5 mA or less (36.9 mA x 0.8 = 29.5 mA). When the present coil temperature rises by 10°C, the coil resistance will be 676 Ω (650 Ω x 1.04 = 676 Ω). To have the must-operate current of 29.5 mA flow in this condition, it will be necessary to apply a voltage of 19.94 V (29.5 mA x 676 Ω =19.94 v). This voltage (which is the must-operate voltage when the coil temperature is 33°C (23°C +10°C), is 83.1% (19.94/24 = 83.1%) of the rated voltage which represents an increase compared to when the coil temperature was 23°C.

• **Coil Temperature vs. Mustoperate/release Voltage**



[Determining lower-limit value of must-operate voltage]

ET > E x (Epv + 5*)/100 x {(T – Ta)/(234.5 + Ta) + 1}
where,
E: Rated coil voltage [V]
Epv: Must-operate voltage [%]
Ta: Coil temperature determining Epv. Unless otherwise specified, 23°C
T: Operating ambient temperature [°C]
ET: Lower-limit value of must-operate voltage [V]

Note: In the above expression, it is assumed that the coil temperature is the same as the ambient temperature, and that T is the value to which the coil temperature has risen as a result of energizing the coil. *5 denotes the safety margin of 5 %.

Continuous Energization for Extended Periods (Months or Years)

In a circuit where the Relay does not release for months or even years with the power supplied, such as an emergency lamp, alarm facility, and error detector circuit in which the Relay releases only in case of an abnormality to issue an alarm signal through its NC contacts, it is recommended that the circuit be designed so that the Relay coil is not excited. This is because, as the coil temperature rises, the Relay is heated and, as a result, the contacts are increasingly corroded. In such applications, therefore, use of Latching Relays and stepping relays is recommended. If the use of the Single Stable Relay is essential, use a fully sealed model which has excellent environmental durability. It is also recommended that the fully sealed model of the Latching Relay be used.

Permissible Voltage for Continuous Use of Coil

The value of the permissible voltage for the continuous use of the coil is generally +10% to 15% of the rated voltage in the case of the AC-operated model and +15% to 20% of the rated voltage in the case of the DC-operated model. The temperature rise at this time is usually 30° to 65°C. This voltage of the DC-operated model may sometimes be expressed in terms of wattage [W], which is obtained by multiplying the coil current squared by the coil resistance (coil current^2 x coil resistance), so that the coil current is limited. The permissible voltage for the continuous use of the coil specified in the Data Sheet of the Relay in question is very important because, unless it is correctly observed, the insulation of the Relay may be thermally degraded, deformed, the other devices connected to the Relay, or even human beings using the Relay may be damaged. Therefore, be sure to observe the permissible voltage. Although Relays employing new wire materials for their coils to improve their characteristics are increasingly available in recent years, it is appropriate to assume that the insulation for these Relays is actually of type E and that the upper-limit value of the temperature rise is 80°C at an ambient temperature of 40°C.

Operate Time

The operate time of the AC-operated Relay considerably varies because of the phase when the switch for energizing the coil is turned ON, and, though it is expressed within a certain range, is about half a cycle (about 10 ms) in the case of a small Relay. However, if the Relay is large in size, the bounce increases, and the operate time is 7 to 10 ms and the release time is 9 to 18 ms. In the case of the DC-operated model, the greater the coil input, the shorter the operate time. However, if the operate time is too short, the bounce time of the NC contact may be prolonged.

Maximum Voltage

Do not use a Relay in such a manner that the maximum voltage specified in the Datasheet of the Relay is exceeded. The maximum voltage of a Relay is determined by various factors, such as coil temperature rise, durability of coil insulation materials, electrical and mechanical life expectancies, and general characteristics. If the maximum voltage is exceeded, the insulation materials may be degraded and the coil may be damaged by burning. In actual applications, however, Relays are often used with their maximum voltage exceeded in order to cope with the fluctuations in the supply voltage. In this case, observe the following points:

(1) Do not allow the coil temperature to exceed the value up to which the spool, the coil insulation materials, and winding wire can withstand.
The temperature up to which the frequently used wiring materials can endure is as shown in the table below (the values in this table are measured by the resistance method).

Wiring materials	Upper-limit value of coil temperature
Polyurethane	120°C
Polyester	130°C

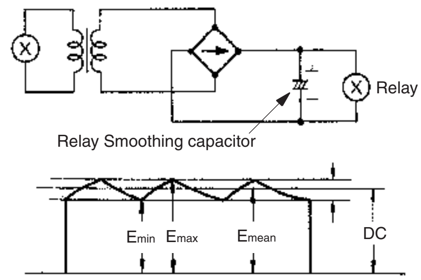
[Measuring coil temperature by resistance method]

t = (R_2 – R_1)/R1 x (234.5 + T_1) + T_1 [°C]
where,
R1: coil resistance before energization [Ω]
R2: coil resistance after energization [Ω]
T1: coil temperature before energization (ambient temperature): T1 [°C]
t: coil temperature after energization [°C]

(2) Confirm that there is not problem when the Relay is used in the actual application system.

Input Power Source

• The power source for DC-operated Relays is in principle either a battery or a DC power supply with a maximum ripple percentage of 5%. If the power is supplied to the Relay via a rectifier, the must-operate and must-release voltages vary with the ripple percentage. Therefore, check the voltages before actually using the Relay. If the ripple component is extremely large, vibration may occur. If this happens, it is recommended that a smoothing capacitor be inserted as shown below.



Ripple ratio (%) = (Emax – Emm)/Emean x 100%

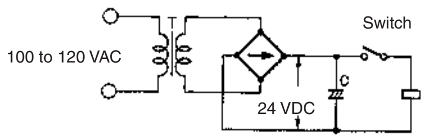
DC component Ripple percentage where, Emax: maximum value of ripple component;
Emin: minimum value of ripple component;
Emean: mean value of DC component

- If a circuit where the voltage applied to the DC-operated coil increases or decreases extremely slowly, each contact of a Multi-pole Contact Relay may not operate at the same time as the other contacts, or the must-operate voltage may vary each time the Relay operates. As a consequence, the sequence of the circuit will not be correctly established. Therefore, the use of a Schmitt circuit is recommended in an important circuit to shape desirable waveforms.
- In a circuit where the Relay coil is applied voltage for a long time, use of a DC-operated Relay is recommended. If an AC-operated model is used, the coil temperature rises to a great value because of the interaction of the copper loss and iron loss (hysteresis of magnetic materials). From the viewpoints of reducing the temperature within the control panel and eliminating the vibration, therefore, the use of the DC model is more advantageous.

Voltage Applied to AC-operated Model

In principle, apply a voltage within +10% to –20% of the rated voltage to an AC-operated Relay to ensure the stable operation of the Relay. Note, however, that the voltage applied to the coil must be a sine wave. If the voltage is applied from a commercial power source, there is no problem. However, when using a AC voltage regulator, beat or abnormal heating may occur depending on the distortion of the waveform of the equipment. Although an AC-operated Relay is of construction that beat is eliminated by a standing coil, the distorted waveform may prevent the standing coil from operating correctly.
When motors, solenoids, or transformers are connected to the same power lines as those of the power supply of the control circuit of a Relay, the supply voltage to the Relay may drop when these devices operate, causing the Relay to vibrate and the contacts to be damaged by burning. This symptom is conspicuous especially when a small-capacity transformer is connected to the Relay, when the wiring length is too long, or when household or commercial cables small in diameter are used. If a trouble of this kind has occurred, examine how the voltage changes by using an oscilloscope or other instruments and take appropriate countermeasures such as employing Special Relays having operation characteristics suitable to the environments of your application and changing the Relay circuit into a DC circuit like the one shown below to absorb the fluctuations in the voltage by a capacitor.

- **Voltage Fluctuation Absorber Circuit with Capacitor 100-VAC Switch**



■ Coil

The most fundamental point to be observed is to apply the rated voltage to a Relay to make sure that the Relay accurately operates. Therefore, when using a Relay, this point must be abided by under any circumstances. Applying the rated voltage to the coil of a Relay is also important for the reason that the coil resistance changes depending on the type of the coil, voltage fluctuation, and temperature rise. On the other hand, however, the voltage applied to the coil must not exceed the maximum voltage specified in the Datasheet of the Relay; otherwise, the coil may be short-circuited and damaged by burning.

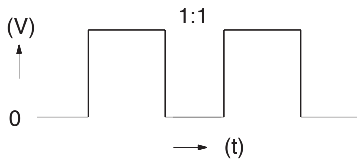
Coil Temperature Rise

When a current flows through the coil of a Relay, heat is generated because of the joule heat (copper loss) of the coil or, on alternate current, of the iron loss of the magnetic materials such as iron core. Consequently, the coil temperature rises. In addition, when a current flows through the contacts, heat is also generated from the contacts, which help the coil temperature rise further.

Temperature Rise Due to Pulse Voltage

When a Relay is applied a pulse voltage whose ON time is 2 minutes or less, the rise in the coil temperature is independent of the ON time, but is influenced by the ratio of the ON time to the OFF time. This temperature rise is much smaller than that when the Relay is used with continuously supplied power, and almost the same for any models of Relays.

Energization time	Temperature rise:
Continuous energization	100%
ON:OFF = 3:1	Approx. 80%
ON:OFF = 1:1	Approx. 50%
ON:OFF = 1:3	Approx. 35%



Changes in Must-operate Voltage Due to Coil Temperature Rise (Hot Start)

When the coil of a DC-operated Relay has been continuously energized, and when the power to the Relay has been once turned OFF and then immediately back ON again, the coil resistance increases because of the coil temperature rises. As a result, the must-operate voltage slightly increases. If the Relay is used in an atmosphere where the ambient temperature is high, the operate voltage also increases. The resistance thermal coefficient of a copper wire is about 0.4% per 1°C, and the coil resistance increases at this ratio. Therefore, to operate a Relay, a current higher than the operate current is necessary, and the current value increases with the coil resistance.

Surge Protection when Coil is OFF

The reverse voltage that is generated by the coil when it is OFF may cause the semiconductor to be damaged and equipment to malfunction. As a countermeasure, either attach a surge suppressor to both ends of the coil or select a model with a built-in surge suppressor (e.g., MY, LY). If a surge suppressor is attached, the release time for the Relay will be longer. Confirm operation with the circuit that will actually be used.

■ Contacts

The contacts are the most important constituents of a Relay. Their operations and characteristics are influenced by various factors such as contact materials, applied voltage and current (especially, voltage and current waveforms on turning ON/OFF power), load type, switching frequency, ambient temperature, contact construction, and the presence or absence of the switching speed bounce phenomena. When the contacts have been adversely influenced by any of or combination of these factors, phenomena such as contact transfer, metal deposition, abnormal wear, and increase in contact resistance occur. To extend the endurance of the contacts and to make sure that they always operate correctly, pay attention to the following points.

Voltage and Current of Contact Circuit

If a contact circuit contains induction, a considerably high counter electromotive force (emf) is generated. The higher the voltage applied to the contacts, the greater the energy of the counter emf, wearing the contacts. Therefore, the value of the current up to which the Relay makes or breaks must be appropriately controlled. If a DC voltage is applied to the contacts, the control capacity of the Relay significantly drops. This is because, on DC voltage, there is no zero point (current zero cross point) unlike on AC voltage, and therefore, if the Relay has generated arc once, the arc is difficult to disappear, resulting in a long arc time. In addition, because the current flows in only one direction, contact transfer, a phenomenon described shortly, occurs, wearing the contacts. The control capacity of a Relay is generally set forth on the Data Sheet of the Relay. However, observing this control capacity is not sufficient. Especially, in a special contact load circuit, the control capacity of the Relay must be confirmed by conducting a test with the actual load.

Current

When the contacts are closed or opened, the current has a significant influence on the contacts. For example, if the load is a motor or lamp, the higher the inrush current when the contacts are closed, the more the contacts are worn and the quantity of contact transfer increases. Consequently, the contacts will fuse and cannot be separated.

Contact Materials

It is important to select appropriate contact materials depending on the load current the contacts are to break or make. The following table lists the contact materials widely used and their features.

Contact Materials and Their Features

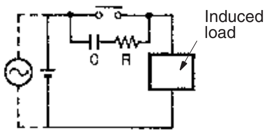
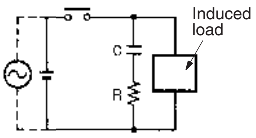
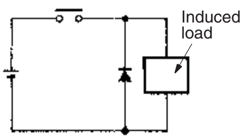
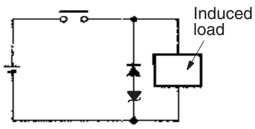
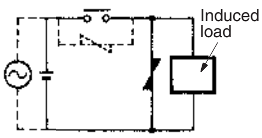
Low load current ◄—► High load current

P.G.S alloy (platinum, gold, silver)	AgPd (silver palladium)	Ag (silver)	AgNi (silver nickle)	AgSnIn (silver, tin, indium)	AgW (silver tungsten)
High resistance to corrosion. Mainly used in minute current circuit (Au:Ag:Pt = 69:25:6)	High resistance to corrosion and sulfur. In dry circuit, likely to absorb organic gas and generate polymer, and thus gold-clad.	Highest conductance and thermal conductance of all metals. Low contact resistance, but easy to create sulfide film in sulfide gas. May cause faulty contact at low voltage and current.	Rivals with Ag in terms of conductance. Excellent resistance to arc.	Excellent resistance to metal deposition and wear.	High hardness and melting point. Excellent resistance to arc, metal deposition, and transfer, but high contact resistance and poor environmental durability.

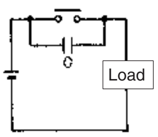
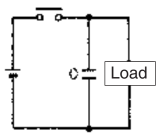
Contact Protection Circuit

It is recommended to employ a contact protection circuit to increase the service life of the Relay, to suppress noise, and to prevent generation of carbide and nitric acid which otherwise will be generated at the contacts when the Relay is opened. Unless used correctly, however, the protection circuit may produce adverse effects. Anyway, the release time of the Relay may be somewhat prolonged. The following table lists examples of contact protection circuits. Note that even Fully Sealed Relays, when used to break a load that may generate arc (for example, an inductive load such as a Relay coil) in highly humid environments, may generate nitric acid due to the NOx generated by the arc and water content, which may corrode the metallic parts of the Relay, causing the Relay to malfunction. Use a surge suppressor as the one shown in the table on the next page when the Relay is used in highly humid environments to break an arc-generating circuit frequently.

Examples of Surge Suppressors

Circuit example		Applicability		Features and remarks	Element selection
		AC	DC		
CR type		* (OK)	OK	*Load impedance must be much smaller than the RC circuit when the Relay operates on an AC voltage.	Optimum C and R values are: C: 1 to 0.5 uF for 1 A switching current R: 0.5 to 1 ohm for 1 V switching voltage However, these values do not always agree with the optimum values due to the nature of the load and the dispersion in the Relay characteristics. Confirm the optimum values through experiment. Capacitor C suppresses the discharge when the contacts are opened, while resistor R limits the current applied when the contacts are closed the next time. Generally, employ C whose dielectric strength is 200 to 300 V. If the circuit is used with AC power source, employ an AC capacitor (without polarity).
		OK	OK	The release time of the contacts will be delayed when a Relay or solenoid is used as the load. This circuit is effective if connected across the load when the supply voltage is 24 to 48 V. When the supply voltage is 100 to 240 V, connect the circuit across the contacts.	
Diode type		NG	OK	The energy stored in a coil (inductive load) is flowed to the coil as current by the diode connected in parallel with the coil, and is dissipated as Joule heat by the resistance of the inductive load. This type of circuit delays the release time more than the RC type.	Employ a diode having a reverse breakdown voltage of more than 10 times the circuit voltage, and a forward current rating greater than the load current. A diode having a reverse breakdown voltage two or three times that of the supply voltage can be used in an electronic circuit where the circuit voltage is not particularly high.
Diode + Zener diode type		NG	OK	This circuit is effective in an application where the diode type protection circuit alone is not sufficient because the release time is delayed too much.	The breakdown voltage to the Zener diode should be about the same as the supply voltage.
Varistor type		OK	OK	This circuit prevents a high voltage from being applied across the contacts by using the constant-voltage characteristic of a varistor. This circuit also somewhat delays the release time. This circuit is effective if connected across the load when the supply voltage is 24 to 48 V. If the supply voltage is 100 to 240 V, connect the circuit across the contacts.	The cutoff voltage Vc must satisfy the following conditions (on AC, it should be multiplied by 2) Contact dielectric strength > Vc > Supply voltage

Avoid use of a surge suppressor in the manners shown below.

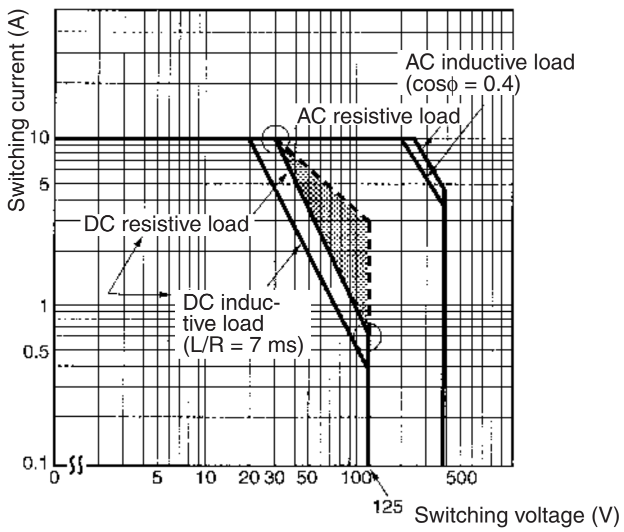
	This circuit arrangement is very effective for diminishing sparking (arcing) at the contacts when breaking the circuit. However, since electrical energy is stored in C (capacitor) when the contacts are open, short-circuit current of C flows into the contacts when they are closed. Therefore, metal deposition is likely to occur between mating contacts.		This circuit arrangement is very useful for diminishing sparking (arcing) at the contacts when breaking the circuit. However, since the charging current to C flows into the contacts when they are closed, metal deposition is likely to occur between the mating contacts.

Note: Although it is considered that switching a DC inductive load is more difficult than a resistive load, an appropriate contact protection circuit can achieve almost the same characteristics.

Load Switching

When the Relay is actually used, the switching power, switching lifetime, and switching conditions will vary greatly with the type of load, the ambient conditions, and the applied load. Confirm operation under the actual conditions in which the Relay will be used. The maximum switching powers for the Relays are shown in the following graph.

Maximum Switching Powers



Contacts

Load	Resistive load	Inductive load (cosϕ = 0.4, L/R = 7 ms)
Rated load	AC: 250 V, 10 A DC: 30 V, 10 V	AC: 250 V, 7.5 A DC: 30 V, 5 V
Rated carry current	10 A	
Max. switching voltage	380 VAC, 125 VDC	
Max. switching current	10 A	

1. Resistive Loads and Inductive Loads

The switching power for an inductive load will be lower than the switching power for a resistive load due to the influence of the electromagnetic energy stored in the inductive load.

2. Switching voltage

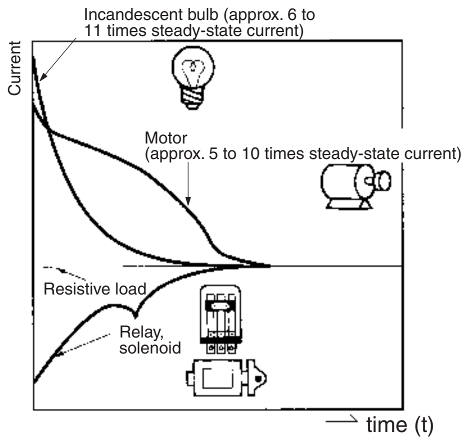
The switching power will be lower with DC loads than it will with AC loads. With DC loads, the switching power will be smaller for higher voltages. Using the values given in the graph *Maximum Values for Switching Power*, the switching power for DC loads at the minimum voltage is $W_{max.}$ = 300 W and at the maximum voltage it is lower, i.e., $W_{max.}$ = 75 W. This difference is the amount that the switching power drops because of the high switching voltage. Applying voltage or current between the contacts exceeding the maximum values will result in the following:

1. The carbon generated by load switching will accumulate around the contacts and cause deterioration of insulation.
2. Contact deposits and locking will cause contacts to malfunction.

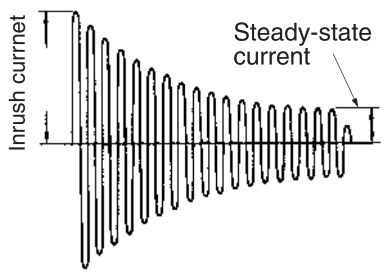
3. Switching current

Current applied to contacts when they are open or closed will have a large effect on the contacts. For example, when the load is a motor or a lamp, the larger the inrush current, the greater the amount of contact exhaustion and contact transfer will be, leading to deposits, locking, and other factors causing the contacts to malfunction. (Typical examples illustrating the relationship between load and inrush current are given below.) If a current greater than the rated current is applied and the load is from a DC power supply, the connection and shorting of arcing contacts will result in the loss of switching capability.

DC Loads and Inrush Current



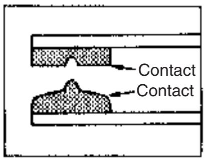
AC Loads and Inrush Current

Type of load	Ratio of inrush current to steady-state current	Waveform
Solenoid	Approx. 10	
Incandescent bulb	Approx. 10 to 15	
Motor	Approx. 5 to 10	
Relay	Approx. 2 to 3	
Capacitor	Approx. 20 to 50	
Resistive load	1	

DC Load Switching

To switch a DC load, the arching can be diminished more accurately by connecting contacts in series because this is equivalent to expanding the contact gap.

In switching a DC load, contact transfer may occur and the contacts may be prevented from releasing by the projection and recess created on the contact surface as shown below.

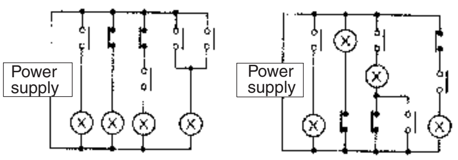


The projection is created because the surface of the contact is virtually spot-welded by the heat generated on the contact surface, and the recess is caused by vaporization and chemical actions. This may happen even when the Relay is used at a load current below the rated current of the Relay. It is therefore important to conduct an experiment to examine if this phenomenon occurs by mounting the Relay in the actual application system.

When the Relay is used to break a DC load, sometimes bluish green substances may be generated in the Relay case. These substances are nitric acid (HNO3) solidified by nitrogen contained in air combining with water content due to the arc discharge that is generated when the contacts are closed and opened. Models MMX and G7X are housed in cases with hole through which the gas is let out to prevent this solidification of nitric acid.

Potential Difference Circuit

In a circuit where the gap between adjacent contacts is small, the power source will be short-circuited if the potential difference exists between the adjacent contacts and the contacts are short-circuited. To prevent the power source from being short-circuited when using, for example, a Multi-pole Contact Relay, perform load connection as in the following figure:

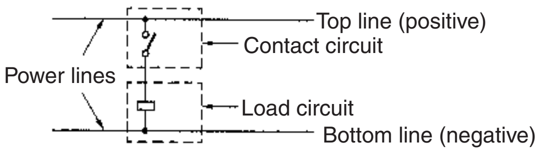


a. Desirable connection   b. Undesirable connection

If the voltage of the load circuit is 20 V or less, or if no arc is generated by the switching of the Relay, use of load connection b is possible. Study your intended application carefully to determine whether load connection b can be used.

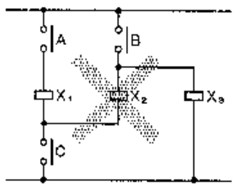
Sneak Circuit

When configuring a sequence circuit, care must be exercised that the circuit does not malfunction due to sneak current. When writing a sequence circuit diagram, it is important that, of the two power lines, the top be considered to be positive and the bottom, to be negative (this does not only apply to a DC circuit but also to an AC circuit), and that contact circuits (such as Relay contacts, timer contacts, and limit switch contacts) be connected to the positive line, while the load circuit (Relay coil, timer coil, magnet coil, solenoid coil, motor, and lamp) be connected to the negative line.



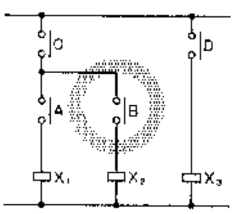
An example of a sneak circuit is shown below. After contacts A, B, and C have been closed, and thus Relays X1, X2, and X3 have operated, when contacts B and C are opened, a series circuit consisting of A, X1, X2, and X3 are formed, causing the Relay to generate beat or not to release.

Incorrect:



An example of a correct circuit is shown below. In a DC circuit, the sneak current can be effectively prevented by using diodes.

correct:



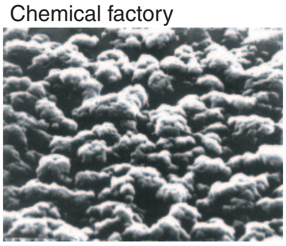
■ Notes on Environment

Contact Degradation Due to Environment

Even if the Relay is not used and just stored, the degradation of the contacts may progress, if the storage environment is not appropriate, due to the influences of the sulfur and chlorine contained in atmosphere. If the Relay is to be stored for such a long period as years, it is recommended to perform a conductivity test when the Relay is actually used, or to use Relays with gold-plated or gold-clad contacts.

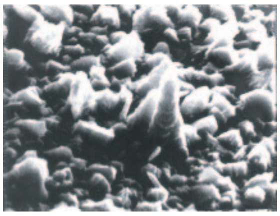
Area	Detected elements	Result of observation of contact surface (Ag contact. Left for 12 months)
Chemical plant	Ag, S	Almost uniform and dense corrosive substances were observed on the entire surface of the contacts. As a result of analysis, Ag_2S was detected.
Steal mill	Ag, S	Irregular projections and recesses were observed and pillars of crystal were dispersed. As a result of analysis, Ag_2S was detected.
Highway	Ag, S, Cl	Circular crystal was sporadically observed. Ag_2S was extremely thin at the white portions.

Chemical factory



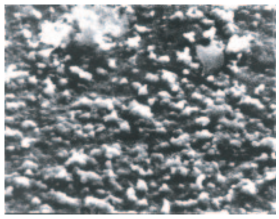
x 5,000

Steel mill



x 5,000

Highway



x 5,000

Electrolytic Corrosion

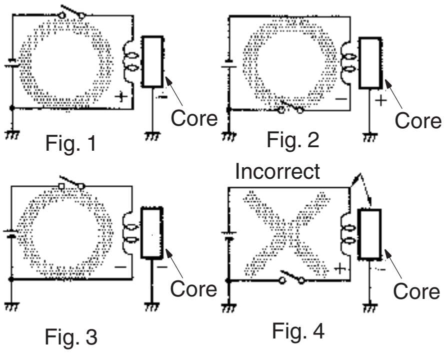
To prevent electrolytic corrosion, it is better not to ground the ground terminal or mounting stud of Relay. If it must be grounded and used in a high-temperature and high-humidity environment, electrolytic corrosion may occur if the grounding is improper, causing the coil wire to sever. In such a case, perform the grounding as follows:

(1) Ground the positive side of the power supply (see Figs. 1 and 2).

(2) In case the positive side cannot be grounded and therefore, the negative side of the power supply has to be grounded, connect a switch to the positive side so that the coil is connected to the negative side (see Fig. 3).

(3) Grounding the negative side of the power supply and connecting a switch to that side may cause electrolytic corrosion (see Fig. 4). Therefore, avoid such a practice.

Correct



Influences of External Magnetic Field

If devices having strong magnetic field, such as transformers and loudspeakers, are placed near these Relays, the characteristics of the Relays may be changed or the Relays may malfunction, though the extent of the characteristic change and malfunction varies depending on the intensity of the external magnetic field.